

Factors that Influence in Non Conforming Product at a Ready Mix Concrete Company

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ABSTRACT

Condition of Ready Mix Concrete-RMC company as a company that deals with facilitating a mix of concrete is hoped to always be in a good condition, so that there would not experience a Nonconforming Product in producing concrete, that is able to be used in establishing a mixture accordingly as planned. This research was conducted in order to determine effect of machine and tool, work method, raw material, environment, measurement and personnel against Nonconforming Product-NCP at a Ready Mix Concrete-RMC product. Technique of data collection was done by spreading questionnaires of questions/statements to respondents who own the Ready Mix Concrete-RMC company, then it was done a data processing that previously had already done by collecting data and data tabulation. Method of statistic analysis in this research was *PLS* by using *software Smart PLS* in order to determine the causality relationship (cause-effect) among variables. Hypothesis finding from this research is, Machine and Tool insignificant, Work Method significant, Raw Material insignificant, Measurement significant, Environment insignificant and Personnel significant have 3 (three) influences, positively and significantly to the Nonconforming Product-NCP, with a multiple regression resemblance as such: $Y1 = 0.206 X1 + 0.129X2 + 0.109X3 + 0.297X4 + 0.163X5 + 0.279X6$, and if productivity threatens wanted is $Y2 = 0,919 Y1$, where as for the variable that is very dominant is variable Measurement Component with an indicator of Estimator Tool Less Accurate Weighing Tool for is 0.609 with the strongest correlation of coefficient.

KEYWORDS: RMC, NCP, Concrete

INTRODUCTION

Concrete has a role that is highly important to an infrastructure building such as road, bridge, large building, dam, plane base and others are of those things that support the smoothness of economical matters, social and politic. For this, the provisioning of concrete in the company of Ready Mix Concrete-RMC must be looked after in order to avoid the Nonconforming Product-NCP quality. Building needs in infrastructure for a concrete tends to increase slightly as the development of society that in needs of such facility. Infrastructure building damage caused by worker is due to the low performance or low in accuracy of the worker himself. Performance of workers are such as affectivity, efficiency, quality of work result, time accuracy starting from those who are doing in the field of work location, who is working in the company of Ready Mix Concrete-RMC, those who are working in the laboratory.

As the need for concrete grows thus the owners of Ready Mix Concrete-RMC company thinks very hard that a product that quailed for such high quality are the first class demand. Currently, the use of concrete generally has become a need because the demand by the market people in the field of infrastructure such as road, bridge, large building, dam, plane base and others are demanded to be finished in no time, accurately, in accordance to quality required and a price that is relatively cheaper. In Indonesia, generally has not yet to apply a system and quality principle that is modern, that has not yet to establish the quality principle centrally in an event for achieving the target required. What is happening is demand by Conforming Product-NCP. A treatment done is not integrated, not consistent that causes the product quality to be not maximum. According to Non-Conforming-NCP it is good and quality produced by the Ready Mix Concrete-RMC company thus an event that occasionally being looked after by contractor of construction service as the customer, is the temperature of burning under specification, lateness of delivering to the working location and many more. Management of old model quality is still around the internal service quality and has not yet reached to external service as hoped by Total Quality Management [1] [2].

The concrete product in Ready Mix Concrete-RMC company that is being sold freely currently, has become very tight compared to the previously product being produced [3]. Such tight competition caused by concrete users such as contractor, consultant, owner and company of Ready Mix Concrete-RMC demands an increase quickly must be anticipated by the Ready Mix Concrete-RMC company if such event of low concrete

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quality occurs. Problem statement and objective of research are activity that includes Non Conforming Product-NCP, as : (1) Determining machine and tool and other variable on Ready Mix Concrete-RMC company production affecting Nonconforming Product on Ready Mix Concrete-RMC (2) Determining among Machine and Tool and other variable on Ready Mix Concrete-RMC company production affecting dominantly toward Non Conforming Product-NCP on Ready Mix concrete-RMC Company.

MATERIALS AND METHODS

In this section, it is examining theories and concept used as the basis in order to explain variable that is going to be studied. Framework of thoughts is built in accordance to theory examined. Next step is to determine hypothesis of research according to the theory of study and framework of thoughts.

Framework of Research Concept

According to theoretical frame and hypothesis proposed therein proposed such variable completed by indicators [4] [5] [6]. Arranging such conceptual framework of research used to explain analysis of relationship among variable such as machine and tool, work method, raw material, measurement, environment and personnel as independent variable and Nonconforming Product-NCP as the dependent variable [7] [8] [9] [10] [11] [12]. Subsequently, proposed variable and indicator according to the result of identification and research in the past as follow:

- a. Machine and Tool Component
Machine and tool used to do the product [13] as the concrete in the Ready Mix Concrete-RMC company has an important role and that variable is often becoming the main obstacle in an establishment of working. Price of machine and the tool are the number four most rs expensive among other resources.
Independent Variable XI Machine and tool with 6 indicators cover: X1.1 Knife Mixer Worn-out, X1.2 Non-Functioning Mixer, X1.3 Belt Conveyor Material Worn-out, X1.4 Broken Hopper Door, X1.5 Non-Functioning Loader, X1.6 Non-Standard Q/C Tool
- b. Work Method Component
Working method includes on how to do an activity so that product [13], such as concrete could fulfilled requirements as hoped by the users. Mistakes and human error in establishing working method thus made the establishment of activity in applying concrete product of Ready Mix Concrete-RMP company could not go economically, effectively and efficiently.
Independent Variable X2 Work Method with, 4 indicators cover: X2.1 Problematic Mixed Proportion, X2.2 Non-Correctly Mixed Plan, X2.3 Procedure of Ordering is Intricating, X2.4 System of Communication is Not Smooth.
- c. Raw Material Component
Raw Material is a mineral material that is ready to be used for a mixed material [13], such as concrete, aggregate, water, chemical admixture and fly ash. That material must have already fulfilled the requirement if it would be used as a mixed material of Ready Mix Concrete-RMC, if it is not fulfilled then it would be affecting the quality of mixed material and thus not be fulfilled.
Variable X3 Raw Material with, 5 indicators cover: X3.1 PC Quality, X3.2 Quality of Hard/Soft Aggregate, X3.3 Water Quality, X3.4 Quality of Chemical Admixture, X3.5. Quality of Fly Ash
- d. Measurement Component
Customers, such as contractors, consultants and owners before checking whether or not the appropriate requirements based on the desired output [14], then the requirements of the measurement is the first priority. Measurement must use the existing provisions so that the results of both the heavy dose and volume can be met.
Measurement of the Independent Variables X4, with 4 indicators include: X4.1. Estimator Tool Less Accurate Weighing, X4.2 Weighing Measuring Tool Is Not Calibrated X4.3 Computing Program Measurement Is In-accurate, X4.4. Measuring Moisture Content In-accurate.
- e. Environment Component
Before examining the requirements of the desired requirements of environmental influences is a major consideration, because the environment has an important role, [15]. Often neglected because it is not the environment will have a negative impact on production Ready Mix Concrete -RMC, but the environment also has a very important role and fundamental.
Independent Variable Environment X5, with 5 indicators include: X5.1.Effects of Hot Weather, X5.2 Effects of Precipitation, X5.3. Washing Waste Material Effect, X5.4 Influence Traffic Congestion, X5.5 Effect of Casting Night.
- f. Personnel Component

How the influence of labor carry out product [16], such as concrete, if the labor force participation is low then it will interfere with the results of concrete mix to be used. The human factor is strongly influenced by the ability, skill, thoroughness of the personnel, if one of these elements shows inability then would end up fatal.

Independent Variable X6 Personnel with, 5 indicators include: X6.1 Officer Sales / Booking Bad, X6.2. Officers at RMC Weighing Less Right, X6.3, Officer Q/C Less Skilled, X6.4 Officer Truck Driver/Loader Less Skilled X6.5, Less Skilled Communications Officer.

g. Non Conforming Product Component

NonConforming product-NCP, in production with expected standards and specifications, various attempts were made in order to fit the required result. However NonConforming Product-NCP is strongly influenced by the quality of the identification results of the independent variable.

Variabel Dependen Y1. NonConforming Product-NCP with, 6 indicators are as follow: Y1.1. Concrete Quality Non-appropriateness, Y1.2. Slump Test Non-appropriateness, Y1.3. Setting Time Non-appropriateness, Y1.4. Cracks After Concrete Hardness, Y1.5. Bleeding Occurs, Y1.6. Segregation Occurs.

Relation Among Variable

The relationship between the dependent variable of Nonconforming Product-NCP, and the independent variables (machines and tools, work methods, raw materials, measurement, environment and personnel) are shown in the above description, then causality (cause and effect) between each variable is as described below. Figure 1 Relationship Between Variables.

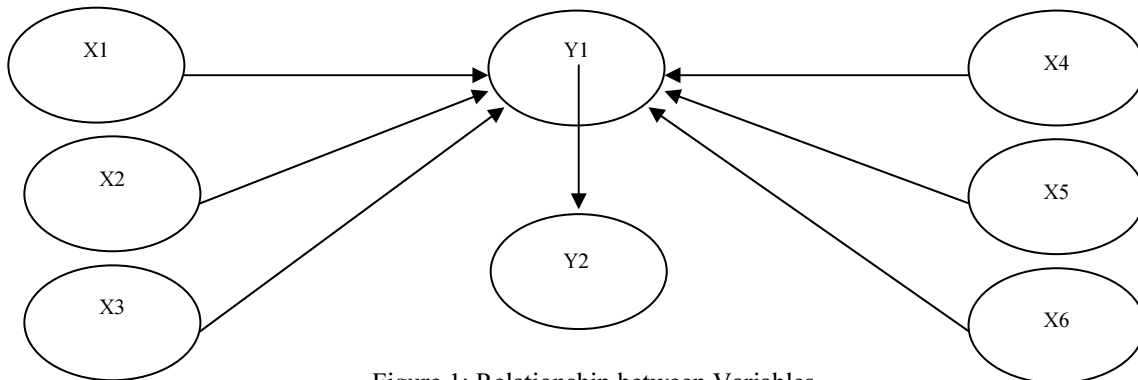


Figure 1: Relationship between Variables

Hypothesis

The research hypothesis is related to the Non-Conforming Product NCP, includes the following activities: (1) There are allegations of machines and Tools and other variables on the production company of Ready Mix Concrete effect on Non-Conforming Product on Ready Mix Concrete -RMC company.

Study Design

Sequence of the study program consists of 6 (six) stages starting from introduction (including background of problem, problem formulation, and the purpose of the study), followed by theory, (both theoretical support, previous research and hypotheses) and research method includes (a variable of the study, the relationship between variables, population and sampling, location of the study, of the study instruments, of the study instruments trial results, the use of statistical analysis *Partial Least Square-PLS*) analysis (data tabulation, data analysis and deliberated), conclusion (conclusion and application advice). [17].

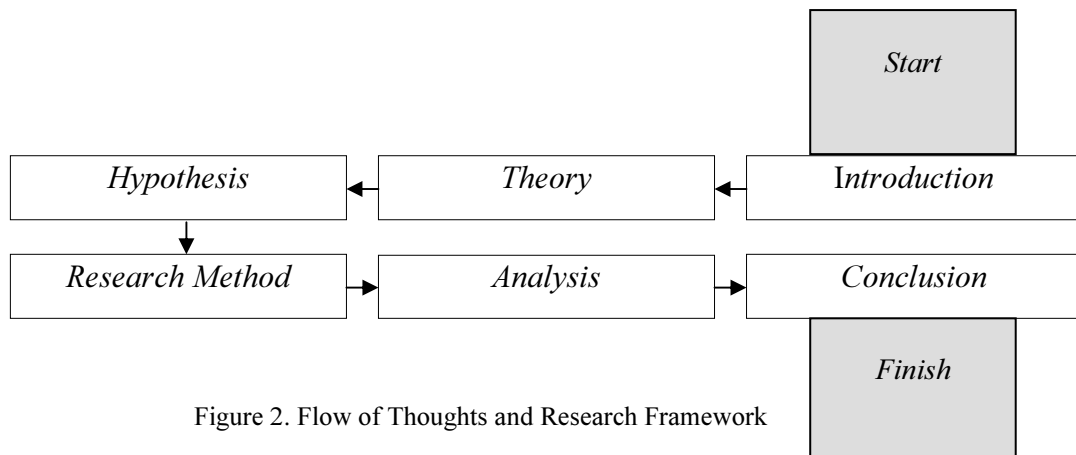


Figure 2. Flow of Thoughts and Research Framework

Research variable

In a research, there is always something to do with research variable, from the variable obtained information then a conclusion. A variable is defined as an attribute that has a variation between one subject/object with others. Variable has a particular variation thus called as variable [18]. Operational definition is a determinant of construct thus becomes a variable that could be measured.

Population and Sample

Total population of Ready Mix Concrete -RMC company in Indonesia are a lot and the study was conducted in the provinces of Java. From the results of cluster sampling in the provinces of the island of Java, such as the provinces of Jakarta, Banten, West Java, Central Java, Yogyakarta and East Java, there are purposive sampling, 105 (one hundred and five) company Ready Mix Concrete RMC company Ready Mix Concrete. Each RMC company Ready Mix Concrete designated as a leader of the respondents techniques. Questionnaires were sent by post and of which has been sent back in good condition.

Instrument of the Research

According Indriantoro [19], that in this study the measurement of the dependent variable and the independent variable is using a Likert scale with a rating scale (score) of 1 to 5, where a score of 1 is the value of a negative extreme value and score value of 5 is a positive extreme value by providing variations in response to each question item [20], are as follows: (1) Strongly Disagree, with a score value of 1, (2) Disagree, with a score value of 2 (3) Neutral, with a score value of 3 (4) Agree, with a score value of 4 (5) Strongly Agree, with a score value of 5.

Results of Trial Instrument of the Research

Trial of the research instrument is a test item, test of the construct validity, reliability testing. Of the number of respondents who were selected were as many as 30 (thirty) which represents the company's production activities on Ready Mix Concrete RMC company. The results of the testing instrument with *item analysis test* results, the average more than 0:30, the *validity test* results on average more than 0.60, and the *reliability test* results an average more than 0.60. with the results of the trial, the research instrument has been qualified so questionnaire does not need to be fixed and the research can continue.

The Use of PLS Statistic Analysis

This study is using statistical analysis of *Partial Least Square-PLS* with *Smart PLS software*, for several reasons, among others, all the independent variables used are *Formative Variable*, required *Factor Loading analysis* of the indicators that are correlated to the creation of variables and a limited number of respondents than the number of indicators and variables [21] [22] [23] [24][25]

RESULTS AND DISCUSSION

Analysis of statistical data *Partial Least Square-PLS* using *Smart PLS software* with independent variable as Machine and Tool, Work Method, Raw Material, Measurement, Environment and Personnel, while the dependent variable is Nonconforming Product-NCP. Testing the model produces standardized regression weight values to variables.

PLS Statistic Analysis

From the results of statistical analysis with *Partial Least Square-PLS* using *Smart PLS software* obtained the following equation: $Y1 = 0.206 X1 + 0.129X2 + 0.109X3 + 0.297X4 + 0.163X5 + 0.279X6$, and if productivity threatens wanted is $Y2 = 0,919 Y1$, independent variables of Machine and Tool insignificant, Work Method significant, Raw Material insignificant, Measurement significant, Environment insignificant and Personnel significant, so that 3 (three) variables positive and significant impact and 3 (three) variable insignificant on the dependent variable Nonconforming Product. Further independent variables of Measurement are the most dominant effect on the dependent variable of Nonconforming Product-NCP. Figure 3 Path Coefficients. Figure 4 T-Statistics.

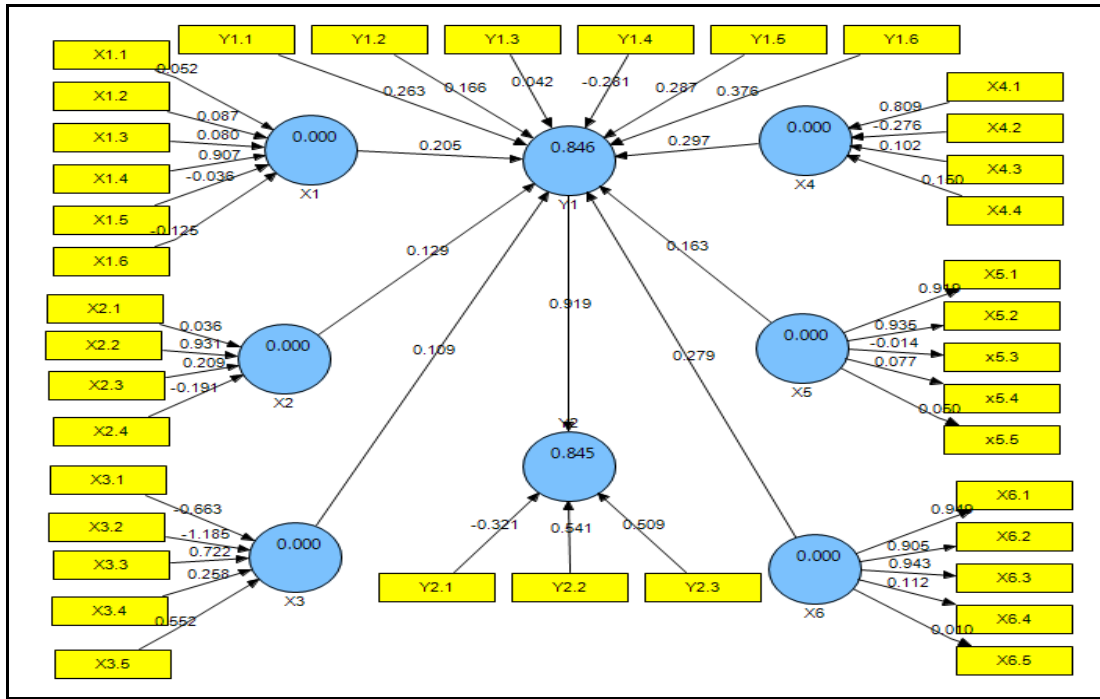


Figure 3. Path Coefficients

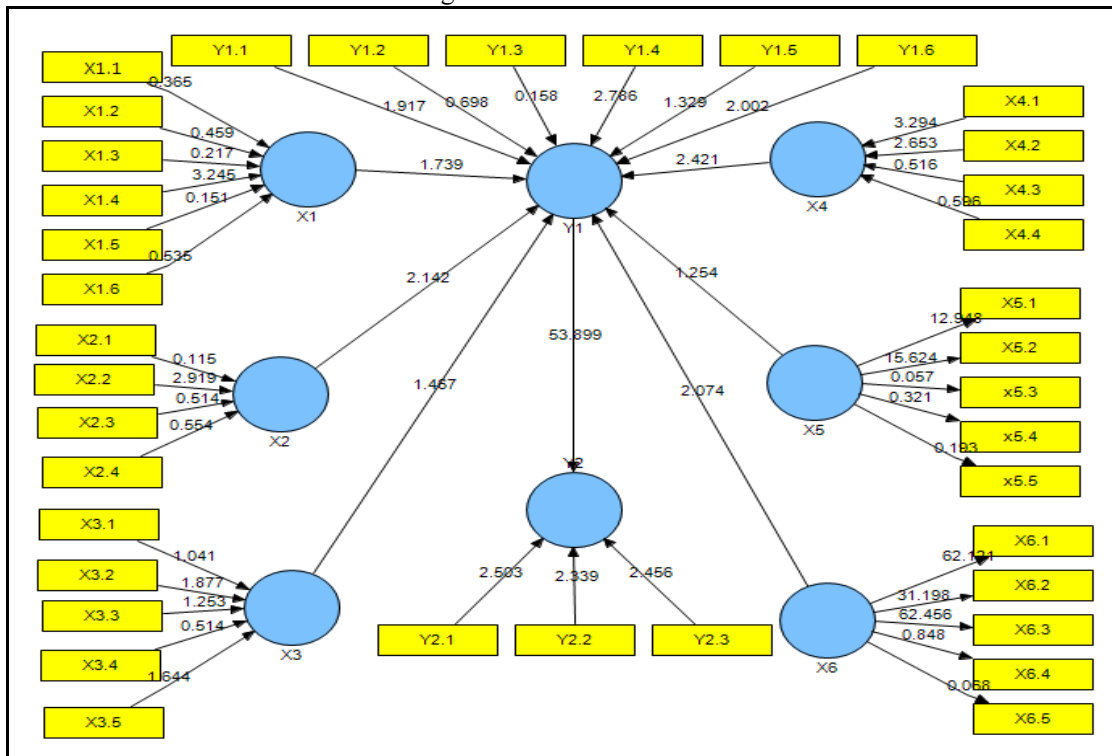


Figure 4 T-Statistics

Table 1 Testing Between Latent Variables

No	Latent Variables	Path Coef	T-Stat	T-Table	Remarks	
1	X1-Y1	Machine and Tool-NCP	0.206	1.739	1,96	Non-Sig
2	X2-Y1	Work Method-NCP	0.129	2.142	1,96	Sig
3	X3-Y1	Raw Material-NCP	0.109	1.467	1,96	Non-Sig
4	X4-Y1	Measurement-NCP	0.297	2.421	1,96	Sig
5	X5-Y1	Environment-NCP	0.163	1.264	1,96	Non-Sig
6	X6-Y1	Personnel-NCP	0.279	2.017	1,96	Sig
7	Y1-Y2	NCP-Product Threatens	0.919	53.599	1,96	Sig

Source: Result of Research

Contributions of Variable Relation

Determinant coefficient of determination (R Square) is a coefficient determine how farther the relationship contribution can be explained by each of variable described are as follows: Contribution of the relationship of independent variables Machine and Tool, Work Method, Raw Material, Measurement, Environment and Personnel, to dependent variable Nonconforming Product by **84, 60%**, and relationship of dependent variable Nonconforming Product to dependent variable Productivity Threatens by **84.50%**.

Biggest Correlation of Indicators against Variables

The Biggest correlation of indicator against variable are variable which variable independent influence against variable dependent. There are 4 (four) variables that influence are as follows:

1. Independent Variable of Work Method X2.
Independent Variable of Work Method has influence to NonConforming Product and has a path coefficient of 0.206 and T-Statistics = 2.142 with factor loading respectively is: X2.1 Mixture Proportion Troubled, X2.2 Mixture Plan Not Right, Convolutd Booking Procedure X2.3, X2.4 Communication System Not Fluent. The Biggest Corelation (*factor loading*) of indicator againt Work Method Variable is X2.2 Mixture Plan Not Right with Factor Loading 0.931.
2. Independent Variable of Measurement X4
Independent Variable of Measurement has influence to NonConforming Product and has a path coefficient of 0.129 and T-statistics = 2.421 with factor loading respectively is X4.1. Weighing Less Accurate Using Measuring Tool, X4.2 Not Calibrated Weighing Tool, X4.3 Computer Program Not Available, X4.4 Measuring Moisture Content Not Accurate. The Biggest Corelation (*factor loading*) of indicator againt Measurement Variable is X4.1. Weighing Less Accurate using measuring Tool. The Biggest Corelation (*factor loading*) of indicator againt Measurement Variable is X4.1. Weighing Less Accurate Using Measuring Tool with Factor Loading 0.809.
3. Independen Variable of Personel X6
Independent Variable of Personnel has the path coefficients of 0.279 and the value of the T-Statistic = 2.074 with factor loading respectively is: X6.1 Officer Sales / Booking is Bad, X6.2. Officers at Ready Mix Concrete RMC company Weighing Less Right, X6.3. Officer Q/C Less Skilled, X6.4. Officers Truck Driver/Loader Less Skilled, X6.5. Less Skilled Communications Officer. The Biggest Corelation (*factor loading*) of indicator againt Personel Variable is X6.3. Officer Q/C Less Skilled with *Factor Loading* 0.943
4. Dependent Variable NonConforming Product Y1
Dependent variable NonConforming Product with the loading factor continuously are : Y1.1. Quality Concrete Is Not corresponding, Y1.2. Slump Test Is Not In-accordance, Y1.3. Setting Time Is Not In-accordance, Y1.4. Cracks Occurred After The Concrete Hardness, Y1.5 Bleeding Occurs, Y1.6. Segregation Occurs. The Corelation (*factor loading*) of indicator againt Productivity Threatness is Y1.6. Segregation Occurs with *Factor Loading* 0.376.

CONCLUSION

From the result of the following analysis, then classifying the effect of the variables therefore the result of the conclusion is as follows: the result of the multiple regression equation is $Y1 = 0.206 X1 + 0.129X2 + 0.109X3 + 0.297X4 + 0.163X5 + 0.279X6$. influence the results of the model influence analysis, towards Nonconforming Product-NCP in the factory product Ready Mix Concrete-RMC, thus : (1) Machine Tool is insignificant, Work Method is significant, Raw Material is insignificant, Measurement is significant, Environment is insignificant and Personnel is significant giving a good impact and significant towards dependentt variable Nonconforming Product-NCP in the factory product Ready Mix Concrete-RMC. (2) Measurement variable hold the major effect toward dependentt variable Nonconforming Product-NCP in the factory product Ready Mix Concrete-RMC. The indicator from the variable with sequence from the biggest – least are as follow: (1). **The Biggest First** of Correlation (*factor loading*) of indicator againt Personnel Variable is X6.3. Officer Q/C Less Skilled with *Factor Loading* 0.943 (2) has **The Biggest Second** of Correlation (*factor loading*) of indicator against Work Method Variable is X2.2 Mixture Plan Not Right with Factor Loading 0.931. (3). **The Biggest Third** of Correlation (*factor loading*) of indicator against Measurement Variable is X4.1. Weighing Less Accurate Using Measuring Tool with Factor Loading is 0.809.

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