A Case Study of Quality Measurement System on CSR Capability by Using DMAIC in Home Industries

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ABSTRACT : *The importance of quality practices has considerably increased over the last years, on both a practical and theoretical level. In competitive and global business environment, companies should create a need for managers in manufacturing sector to effectively and continually improve quality, capability and process efficiency. This paper presents the findings from the survey on the current status of measurement system on CSR capability by using SQC and DMAIC method (Define-Measure-Analyze, Improve and Control) in fulfilled the standard of quality product in home industries based. Case study was one of growth home industries supported by CSR of PT. Pertamina Gas (Pertagas) in Prabumulih, South Sumatera. The chosen of industry as they contribute in absorption of local content raw materials produce by using the vacant land along the yard. The aims are to determine whether the essential quality measurement such as SQC snf DMAIC as have a significant contribution to reduce the production reject and increasing the utility of raw material from local content and develop the value added in the future. This paper outlines the results of the research conducted on the industries under CSR programme, it was found that the CSR program by Pertagas was effective in reducing product reject and give good contribution in spread the local product into the market, either local and national area as shown by ANOVA test. The main finding from the study proved that suitable program of CSR was give positive contribution on quality improvement.*

KEYWORDS *–ANOVA, CSR, DMAIC, Quality improvemen,t Quality measurement, SQC*

I. INTRODUCTION

Quality Management provides the overall concept that fosters continuous improvement in an organization. The stresses of quality philosophy are on systematic, integrated, consistent, organization-wide perspective involving everyone and everything, from input throughout output. The quality itself is also focuses primarily on total satisfaction for both the internal and external customers, within a management environment that seeks continuous quality improvement of all systems and processes. Total quality management and/or quality practices theory has been influenced by the contributions made by quality pioneers and/or quality leaders such as Crosby, Deming, Ishikawa, Juran, Feigenbaum and many more. The development by all these quality experts shows significant improvement of manufacturing process and its system Klassen (2000)[1] andAbRahman et.al, (2009)[2]. Improvements in the manufacturing system can lead to direct and indirect improvements to company environmental management practices, particularly in overall waste reduction (Desai &Shrivastava 2008)[3]. Positive relationships have been established between environmental performance and improvements to the aspects of the manufacturing system; including quality management and lean manufacturing practice(Albliwi. & Antony2013)[4].

As one of industries which also has concerned on the quality basis, PT Pertamina Gas (Pertagas) is one of a company engaged in the oil and gas, Pertagas are optimistic in the capability to open the viewpoint of the community related to oil and gas industry activities which in principle engage in realizing sustainable benefits for every generation. Armed with a culture of continuous learning, innovate and explore positive potentials, Pertagas is focusing on sharpening and improving the range of efforts that have been undertaken for continuous improvement (AR Pertagas, 2016)[5]. As related to the responsibility was taken in sustainability on environment as the impact of their social contributions, Pertagas was activating the contribution of corporate social responsibility (CSR) to develop the economic growth of local community.

Pertagas spent IDR 3,046,368,626 (58,1%) on community empowerment as part of CSR program.As a huge amount share, the effectiveness of budget absorption should come to the priority of Pertagas in fulfil the community needs of the improvement. The appointed on economic community development, Pertagas appointed local industry based home industry to be part of the economic development program under their CSR program. Thus, this paper discussing about using a statistical quality control and Analysis of Variance (ANOVA) for measure the capability of CSR program in enhance quality process on 'traditional' home industry and meets the specification after the new machine had been installed. It also provide how to assest the measurement system before capability study, with measurement system analysis (Chen et al., 2002)[6].

II. LITERATURE REVEW

2.1 Corporate Social Responsibility (CSR)

The concept of corporate social responsibility (CSR) has been advocated for decades and is commonly employed by corporations globally, agreement on how CSR should be defined and implemented for corporations because they are increasingly being required to align with societal norms while generating financial returns. As the definitions, corporate social responsibility (CSR) is a business system that enables the production and distribution of wealth for the betterment of its stakeholders through the implementation and integration of ethical systems and sustainable management practices (Bowen 1953)[7].

Over the subsequent decades, CSR definitions, practices and adoption of CSR expanded immensely. Philosophies such as management as a trustee, ethics and the balance of power between business and society were popularized (Frederick, 2006)[8]. A paradigm of the CSR by recognizing that's a balance between social and economic interests was a necessary factor. Carroll (1979)[9] developed the corporate social performance (CSP) model whereby CSR, social issues and corporate social responsiveness were considered the leading philosophy for corporations to behave in a socially responsible manner.

The inclusion of strategic philanthropy, innovation, environmental sustainability and transparency demonstrate how diverse and far reaching CSR has become embedded into management strategy. And most recently, corporate financial performance and the measurement of CSR activities is causing corporations to understand the strategic value of CSR through the realization that the implication to a business' operations is essential (MIT, 2011)[10].

2.2 Quality management and measurement

Quality means different things to different people and therefore there are many definitions and approaches. Quality culture varies, not only amongst the different organizations, but also among the different divisions of the same organization. In a quality culture, the customer is the most important part of the process, and if the process quality is attained, customer satisfaction should be assured. Quality is the system, which, when implemented, yields increased market share and reduced scrap and rework. Deming (1990)[11] stated that quality is the umbrella of a plethora of process improvement techniques and theories that starts with a company's vendors and extends beyond the sales of that company's products and services to the consumer.

The improvement of quality system must be applied continuously and consistently conformance to requirement of a self-disciplined, with everyone in the organization motivated to improve the quality system (Crosby, 1979)[12]. Define, Measure, Analyze, Improve and Control (DMAIC) and Statistical Quality Control (SQC) are two methods among quality measurement system, which used to figure the improvement in quality products, either services or goods.

2.2.1 Define, Measure, Analyze, Improve and Control (DMAIC)

DMAIC is an abbreviation of the five improvement steps it comprises: Define, Measure, Analyze, Improve and Control. All of the DMAIC process steps are required and always proceed in the given order.

Define

The purpose of this step is to clearly articulate the

business problem, goal, potential resources, project scope and high-level project timeline. This information is typically captured within project charter document. Write down what you currently know..

Measure

The purpose of this step is to objectively establish current baselines as the basis for improvement. This is a data collection step, the purpose of which is to establish process performance baselines. The performance metric baseline(s) from the Measure phase will be compared to the performance metric at the conclusion of the project to determine objectively whether significant improvement has been made. The authors decide on what should be measured and how to measure it. It is usual to invest a lot of effort into assessing the suitability of the proposed measurement systems. Good data is at the heart of the DMAIC process:

Analyze

The purpose of this step is to identify, validate and select root cause for elimination. A large number of potential root causes (process inputs) of the project problem are identified via root cause analysis (used a fishbone diagram). The 5W+H (what, where, when, who, why and how) will be used to validate the top 4 root causes. A data collection plan is created and data are collected to establish the relative contribution of each root causes to the project metric. This process is repeated until "valid" root causes can be identified.

Improve

The purpose of this step is to identify, test and implement a solution to the problem; in part or in whole. This depends on the situation. Identify creative solutions to eliminate the key root causes in order to fix and prevent process problems. Focus group discussion (FGD) technique was used in solving the problem and applied Ishikawa Diagram.

Control

The purpose of this step is to sustain the gains. Monitor the improvements to ensure continued and sustainable success. Create a control plan. Update records as required.

A Control chart can be useful during the control stage to assess the stability of the improvements over time by serving as: a guide to continue monitoring the process and provide a response plan for each measurement being monitored in case the process becomes unstable.

2.2.2 Statistical Quality Control (SQC) with p-Chart.

Statistical quality control (SQC) was popular by Walter Shewhart a mathematician. SQC can be used for analyze for both of the process either in control or out of control. In SQC, the **p-chart** is a type of control chart used to monitor the proportion of nonconforming units in a sample, where the sample proportion nonconforming is defined as the ratio of the number of nonconforming units to the sample size, n.

The p-chart only accommodates pass or fail-type inspection as determined by a tests, effectively applying the specifications to the data *before* they are plotted on the chart. Other types of control charts display the magnitude of the quality characteristic under study, making troubleshooting possible directly from those charts. The formula for analyze is as below:

$$UCL = p + 3\sqrt{\frac{p(1-p)}{n}} \quad \text{.....(1)}$$

$$LCL = p - 3\sqrt{\frac{p(1-p)}{n}} \quad \text{.....(2)}$$

As the formulation mentioned above, for p chart is the estimate of the long-term process mean established during control-chart setup. Meanwhile, if the lower control limit is less than or equal to zero, process observations only need be plotted against the upper control limit. Note that observations of proportion nonconforming below a positive lower control limit are cause for concern as they are more frequently evidence of improperly calibrated test and inspection equipment or inadequately trained inspectors than of sustained quality improvement (Wheeler, 2017)[13].

2.3 Normality test

Normality test be used to know whether the data gather in normal distribution or not . If the data in normal distribution then parametric statistic can be used. The normality is affected by instrument and data that collected (Burdicket al.,2002)[14].If the p-value less than 0.05 then can be resumed that the data collected have no different with the virtual normal. If the p-value higher than 0.05 then can be resumed that the data have significant different with normal virtual. The sample size can be used to determine if the data

had been collected from the normal population or not. The normality test used onKolmogorov Smirnov. The test is examine the different in both data, so that to be tested against in normal standard. If the result less than 0.05 it means that there is no significant different in the data, meanwhile, if the testing result p value higher than 0.05 there is exist the differences (Corder& Foreman,2014)[15].

III. CASE STUDY

3.1 Methodology

This research aims to describe an investigation into how the industry developed through the supporting of CSR contribution along the company area. The approach was focused on development, implementation and evaluating in the operation of selected home industry. The research was carried out in home industry in Prabumulih, South Sumatra, Indonesia.

The methodology relies on the creation the value added on business and keeping well organized, clean, high effective and the quality product. This research has been carried out in the selected of development local product home industries, denoted the herbs supplement. The industry was selected because it provided specific herbs from local and the subject of inquiry (Yin, 1994)[17]. The industry performance was considered essential for increasing the product's competitiveness. This research is used observation on production process and interviews (Diamond, 2001)[18], and literature search in gaining empirical evidences. During these research it was executed the selection of things in production process, on each workplace and based on the supplier-input-process-output and product to customer.

3.2 Selection of Industry

The industries were selected based on the industries support by Pertamina Gas and their willingness to participate in the study. This research is focused on Asuhan Toga Mandiri (Toga) a home industries in Prabumulih, South Sumatra as the center of Pertagas CSR implemented and they represented growth home industries which is contribute to absorption of fenced as park land used in Indonesia.

IV. SURVEY RESULT

A. COMPANY BACKGROUND

As a company engaged in the oil and gas main business activities of Pertagas (AR Pertagas, 2016)[8] are:

- Conducting business in the field of natural gas and its derivatives, transportation / transmission, processing, storage and other business includes gas distribution, Natural Gas Liquid (NGL), Liquefied Petroleum Gas (LPG), Compressed Natural Gas (CNG) and Liquefied Natural Gas (LNG), LPG and CNG.
- Conducting general trading field including import /export of natural gas as well as becomes a distributor and agency / representative of companies at domestic and abroad.
- Conducting business in the field of oil transportation through pipeline and natural gas through pipeline, ship, land vehicle and storage.
- Conducting business in the field of laboratory inspection services, operation and maintenance of
- Production equipment, transportation, storage and processing of natural gas.
- Conducting business in the field of electricity.

Pertagas are optimistic in their capability to open the viewpoint of the community related to oil and gas industry activities which in principle engage in realizing sustainable benefits for every generation. Armed with a culture of continuous learning, innovate and explore positive potentials, Pertagas is focusing on sharpening and improving the range of efforts that have been undertaken for continuous improvement (AR Pertagas, 2016)[8].

Up to the end of 2016, Pertagas has obtained net profit of USD 159.17 million, which was USD 8.02 million or 5.31% higher compared to 2015 which reached USD 151.15 million. The total assets of Pertamina Gas during the year 2016 increased from USD 1.84 billion to USD 1.88 billion. The value increased by USD 37.83 million or 2.06% compared to the end of year 2015.In line with the improvement of financial and operational performance, Pertagas continues to realize the various development plans that have been set. With an estimate of good demand and subdued prices in the future. In addition, the Board of Commissioners, supported by the Board of Assistant Committees, also conducts working visits

to operating locations in business units to know more clearly about the constraints faced in achieving operational performance. To further formulate improvement recommendations in management and operation to the management according to the needs and problems faced.

The establishment of the Company is the implementation of Law no. 22 of 2001 regarding Oil and Gas. As the implementation of the Law, then November 23, 2001 the status of PT Pertamina (Persero) has changed, from the original as a business actor as well as regulator, into State-Owned Enterprises (SOEs). Based on a memorandum from Upstream Director of PT Pertamina (Persero) No.39D / d00000 / 2007-S1 dated May 21, 2007, the Company obtained approval for the transfer of asset management and gas business activities from PT Pertamina (Persero). Furthermore, PT Pertamina (Persero) changed the pattern of gas business activities that have been run by the upstream directorate through the gas utilization division, into an activity undertaken by a separate business entity, PT Pertagas. As on October 6, 2008, PT Pertagas obtained a business license in the commercial and gas transportation business of the Ministry of Energy and Mineral Resources. The company further focuses on expanding the business on transportation and gas processing lines. In line with the vision of PT Pertamina (Persero) mission to become an energy company in Indonesia, PT Pertamina Gas has expanded its business activities to support the objectives.

4.2 Corporate Culture: Clean, Competitive, Confident, Customer, Commercial, Capable (6C*)*

As corporate culture strengthened on Clean, Competitive, Confident Customer, Commercial and Capable, Pertagas has been tried to create best atmosphere for company operational, either for employee and also customer. Clean mean the company is professionally manage; Competitive is being able to compete on a regional or international scale; Confident is role in national economic development; Customer oriented and committed to provide the best service to customers; Commercial is creating value added with a commercial orientation; Capable was managed by professional leaders and workers with high technical talents and capability; and also implementing Corporate Social Responsibility (CSR). In accordance with the Company's organizational structure, the management of CSR becomes the duty and responsibility of the Public Relations & CSR function, which are responsible to the Corporate Secretary.

Implementing the Company's commitment to social and environmental responsibility, which add value to each stakeholder to support the Company's growth.

4.3 CSR Basic Reference

• Law No.25 Year 2007 on Investment. Article 15(b) explains that every investor is obliged to carry out corporate social responsibility. The meaning of corporate social responsibility is: the responsibility inherent in every investment company to keep creating a harmonious, balanced, and appropriate relationship with the environment, values, norms and culture of the local community.

• Law No.22/2001 on Oil and Gas. Article 40 provides that Business Entities or Permanent Business Entities ensure the safety and health of work and the management of the environment in addition to being responsible in developing the environment and the local community. The company participating in the responsibility of developing the environment and local community is the participation in developing and exploiting the potential and ability of the local community.

Ministerial Regulation of SOEs No. Per-05/MBu/2007 as amended lastly with Ministerial Regulation No. 08/MBu/2013 on Partnership Program of State-Owned Enterprises with Small Business and Community Development Program. Pertamina Gas conducts CSR by involving the stakeholders in the operational activities discussed in this Report. Each CSR activity is defined through a gradual process.

4.4 Funding and Financial Impact

In 2016, the Company had placed funding of CSR program/activities, amounting to IDR 4,563,534,782. The amount is up 93% compared to the year 2015 IDR 2,365,369,824.

Sources of funds placed are derived from

(AR Pertagas, 2016)[8]:

- Pertamina Gas operational fund amounting to IDR 750,030,593 derived from operational funds of Corporate Secretary, Operating area and Project Investment Cost.
- PT Pertamina (Persero), amounting to IDR 3,813,504,189 derived from the budget of CSR function. The placement of such funds has no effect on the Company's financial performance. Fund utilization is prioritized to finance programs/activities in five areas, namely education, health, environment, infrastructure and community empowerment.

Pertamina Gas (Pertagas) meets the CSR related to living environment under the UU No.32 year 2009 on Environmental Protection and Management. PT Pertamina Gas was joined with all stakeholders and committed to joint efforts to safeguard and preserve the environment, meanwhile also focused to the economic process. All operations and business activities of the Company consistently include environmental studies and environmental management in order to reduce potential environmental impacts.

4.5 CSR Preparation and Implementation

The Company ensured that there was no Operating Area that obtained a Red Proper rating (up to end of 2015). This achievement signifies that all environmental management activities carried out by each operating Area have been in accordance and exceeded the applicable provisions related to environmental management.

As the study requirement, the industries classification, home industry put under micro cell industries as they applied less than 10 man power in manufacturing process (Ab. Rahman et al, 2011)[2]. The company was selected in this study has been appointed under CSR contribution of Pertagas Area in Prabumulih, South Sumatra. Stages of preparation and implementation of CSR activities:

- The preparation of CSR program begins with social mapping conducted in the operational area of Pertamina Gas.
- In addition to social mapping, the Company is also considering community proposals.
- The results of social mapping and community proposals/requests are prepared in CSR work plans and budgets.
- All program recapitulation is submitted to PT Pertamina (Persero) as the parent company. The budget allocation is then determined by PT Pertamina (Persero) through RKA approval.
- Proposed CSR programs not included in the allocation of funds of PT Pertamina (Persero) will be fulfilled by internal funds of Pertamina Gas.
- Pertamina Gas submits approved CSR programs to the area.
- The area determines the implementation of the CSR program, either through the appointment of the consultant or self implementation.

Monitoring and evaluation activities are carried out by each area and reported to Central Pertamina Gas's PR and CSR functions.

B Analysed on CSR Contribution

The core subjects have a substantial focus on stakeholder management and ethical behavior. The standard may provide some useful guidance corporations can leverage; however, there are a number of shortcomings. A significant flaw is that the standard attempts to create the same guidance for private and public sector organizations. Simply, the purposes of private and public sector organizations are vastly different, so although there may be some commonalities between them, there are too many factors that would be critical to each group that are omitted. For corporate social responsibility to flourish, ISO 26000 needs to include management functions that most academic research, businesses and definitions regard essential for effective CSR (ISO, 2010)[16].

Furthermore, the program or activity conducted under Pertagas Budgeting. The scenario of CSR contribution as shown in Table 1:

Table 1 Utilization of CSR Budget in 2016

No	Program/Activity	Amount (in IDR)	Percentage (%)
1.	Education	215,137,626	4,1
2.	Health	318,881,237	6,1
3.	Environment	304,116,700	5,8
4.	Community Empowerment	3,046,368,626	58,1
5.	Donation	679,030,593	13,0
6.	Social Mapping	679,030,593	13,0
	T o t a l	4,563,534,782	

Source: AR Pertagas 2016

Community empowerment has been given the big part on corporate social program from the

Pareto chart as shown on Figure 1.

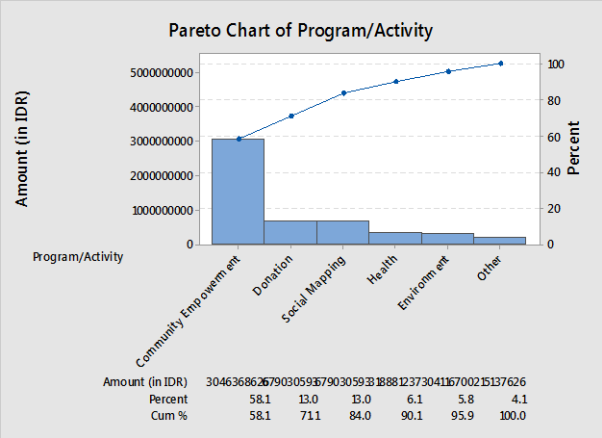

Figure 1 Pareto Chart of CSR Program/Activity

The increase in the attractiveness of CSR activities can be demonstrated in a host of surveys amongst global business executives. As stated in a study by Masaka et.al. (2008)[17], executives stated overwhelmingly that corporations must balance shareholder needs while making contributions that benefit society. CSR of Pertagas is also viewed as a means to manage complex sociopolitical issues businesses face and reduce risk for their organizations. The range of issues affecting their organizations is overwhelming, which include challenging subjects such as climate change, health care and ethics practices.

The contribution of Pertagas CSR program to Toga home industries ie by provide packaging tools (vacuum sealed) and training program on standard product of herb industries and collaboration with Public Health Dept (Dinkes) and Food and Drug Regulatory Agency (BPOM), Prabumulih. As the result, on production based, reject product was decreased from 25% (from total herb produced per period before September 2017) to the average less than 10% (since September 2017) (see Table 2).

Based on the reject categorized found during the study, it was found that 51% from the data reject was moldy. Reject or N/G (not good) product was produced by herbs process on production. Flow process for producing powder of red ginger, zedoary and lesser galangal, based on the sub sequential flow process chart (FPC) as shown on Figure 3:

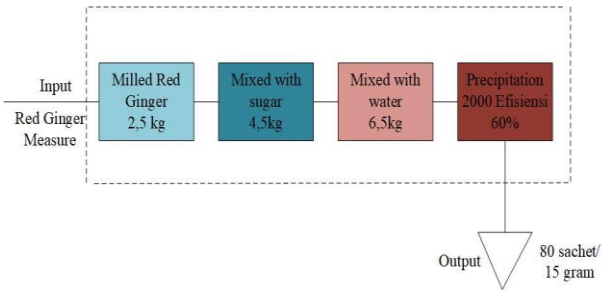

Figure 3 Flow Process Production Herbs (Red Ginger, Zeodary and Lesser Galangal)

Subsequently, when the first product finished ie; powder of red ginger and it will follow by another same process for zedoary and lesser galangal. Thus, the reject data was collected and categorized as shown on Figure 2.

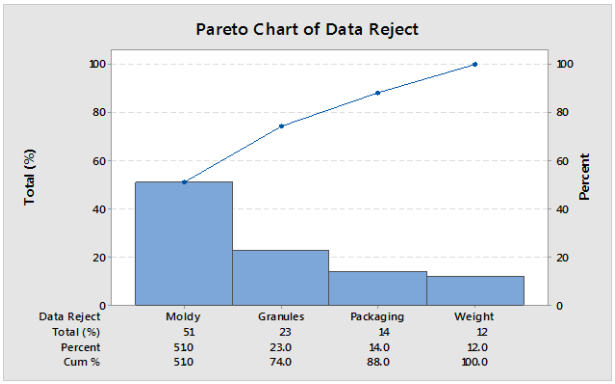

Figure 2 Pareto Chart of Data Reject

Packaging process as shown on Figure 4:

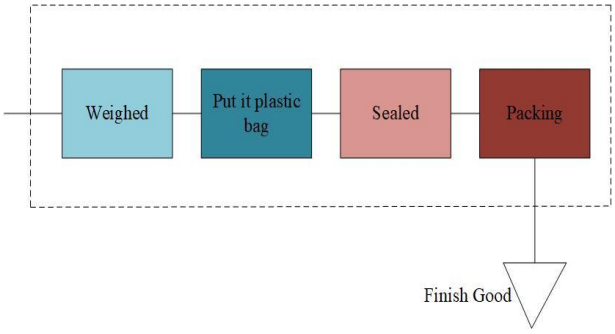

Figure 4 OPC Packaging

C Analyzed of CSR Capability Program among Industries Built

This section examines the effects of CSR implementation to the quality product on home industry basis. The data collected during the survey:

Table 2 Data Reject Collection during Sept 2017 - Jan 2018

Periode	Total Production (N)	Percentage (N/G)
1	80	0.15
2	80	0.10
3	80	0.14
4	80	0.09
5	80	0.11
6	80	0.11
7	80	0.13
8	80	0.09
9	80	0.10
10	80	0.11
11	80	0.09
12	80	0.09
13	80	0.06
14	80	0.04
15	80	0.04
16	80	0.05
17	80	0.06
Total	1360	

4.6 Normality Test Result

Test of normality data with use Kolmogorov – Smirnov in MINITAB as shown in Figure 5:

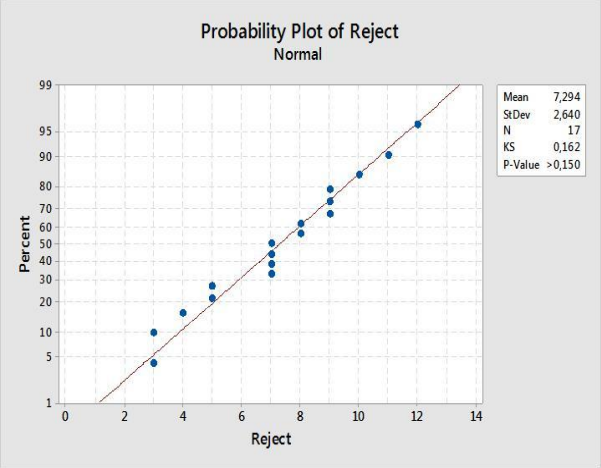

Figure 5Normality test for data

The p-Value=0.150 and the p – Value is higher than 0.05, the each point follow the central line and each point close to central line, which is indicate the data in normal distribution(Chandana,2017)[18]. When the data is normal, then can be use for continue to analyze the measurement data analyze by using control chart.

4.7 Statistical Process Control Analysis

When the normality test have already done and the result on tracked, continous by processing sampling data for statistical process control. Processing data from study is addressing to the total production consider for80 sachet per production schedule and each sachet contain of 15 grams of each. Data for the study result that already collected and proceed into the control chart as below with total data are 17:

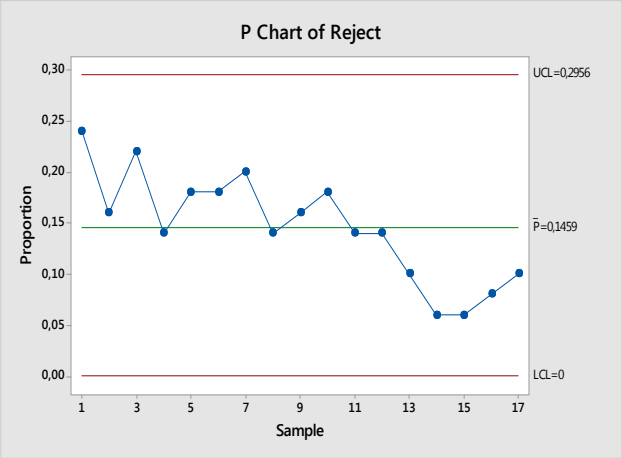

Figure 6 Control Chart for Data Reject

From the control chart on Figure 6, all data sampling are in control limit it means that the data sampling bead in control.

4.8 Ishikawa Analysis

Ishikawa diagrams (also called fishbonediagrams, herringbone diagrams, cause-and-effect diagrams or Ishikawa)are causal diagrams created by Kaoru Ishikawa (1976)[19] that show the causes of a specific event. Common uses of the Ishikawa diagram are product design and quality defect prevention to identify potential factors causing an overall effect. Each cause or reason for imperfection is a source of variation. Causes are usually grouped into major categories to identify and classify these sources of variation. As shown from the study:

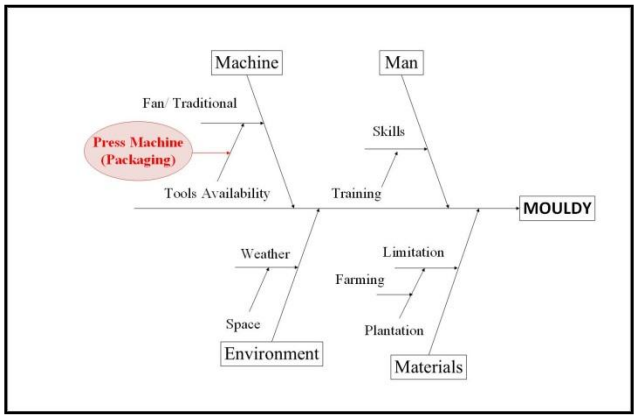

Figure 7 Cause Effect Diagram for reduce reject

As root-cause analysis is intended to reveal key relationships among various variables, and the possible causes provide additional insight into process behavior. From the study, its found that moldy caused by non appropriate tools used on process draying. As further discussion with PIC MrsSiti M. from Asuhan Toga Mandiri (Toga), Jan 2018. She mentioned that PertagasPrabumulih, giving full supported for them to developed their business on herbs production. Pertagas provided vacuum sealed for packaging, since August last 2017. Furthermore, after machine installment, the reject product was decreasing simultaneously. As before the vacuum press provided by Pertagas, rejected product higher than 25%, around 20 sachets for each period or production. As shown in p-chart, all the production under control, event reject still exist.

The data was further analyzed using the analysis of variance (ANOVA) procedure, produced by the Statistical Product for Social Science (SPSS) program. The ANOVA list of CSR Program and Reject data as shown in Table 2. With the use of ANOVA test, the differences within each set of variables were tested at 95 per cent confidence level. The ANOVA test revealed that, CSR Program have significant positive effects on company performance in quality improvement.

Table 3 ANOVA test on CSR Program and Quality Improvement

Impact		N	Mean	F	Sig
Quality Product	CSR	17	0.684	.401	.064
	Non-CSR	5	0.571		
	Total	22			

However, the findings have shown that CSR Program have a significant contribution (0.064 less than 0.5) to improve quality performance in organizations. There is no doubt that the implementation of the various quality initiatives can continuously improve business performance, sustain productivity and competitiveness in organizations. Hopefully, it would motivate more organizations or company looking forward and built home industries as the target of CSR program.

V. CONCLUSION

Relatively little academic research, it appears, is currently being devoted to the subject of improving the CSR program capability in developing local economics community. The result of the study provides some useful information about quality improvement among industry built by Pertagas CSR program. The findings collected give a good foundation, describing essential of quality practices and potential for development, as described by result and anyalzed of SQC and DMAIC. Clearly, this is a great scope for Pertagas area to develop their CSR program among the industries in local community. As shown by ANOVA test result that CSR program have a significant contribution in improving quality performance.

The analysis of the survey results based on the data process as shown in control chart has provided evidence for the correlation between the CSR program and quality benefits. The main finding is that the CSR program on home industry provides an essential of quality improvement by increase the capability of CSR program among the industry built, successfully. The survey methodology used in this study especially for interview had several limitations. Due to time and resource constraints, the number of the case study companies that participated in the survey was quite a small sample size, as the limitation and decision on chosen industry to involve in the area of CSR program by Pertagas. Therefore, the results of this study must be treated with caution, as mentioned that the home industries is giving good contribution to develop the economics of local community.

REFERENCES

[1] Klassen, R. D. 2000.Exploring the linkage between investment in manufacturing and environmental technologies, *International*

Journal of Operations & Production Management. 20 (2), 2000, 127-147.

[2] AbRahman M.N, Hernadewita, Baba Md. Deros, Ahmad Rasdan Ismail. 2009. Essential quality practices in Indonesian manufacturing SMEs. *Journal - The Institution of Engineers. Malaysia.* 71 (2), 2000, 36-43.

[3] Desai, T.N. &Shrivastava, R.L. (2008). Six Sigma – A New Direction to Quality and Productivity Management.*Proceedings of the World Congress on Engineering and Computer Science 2008,* WCECS 2008, October 22 - 24, 2008, San Francisco, USA.

[4] Albliwi, S. & Antony, J. (2013). Implementation Of A Lean Six Sigma Approach In The Manufacturing Sector: A Systematic Literature Review. *Proceedings of the 11th International Conference on Manufacturing Research (ICMR2013)* Annual Report Pertagas, 2016.

[6] Chen KS, Chen SC, Li RK .2002. Process quality analysis of products. Int J Adv Manuf Technol 19(8):623–628.

[7] Bowen H.R. (1953). *Social responsibilities of the businessman*. Harper and Row: New York.

[8] Frederick, W. (2006). *Corporation, be good! The story of corporate social responsibility*. Indianapolis: Dog Ear Publishing.

[9] Carroll, A.B. (1979). A three-dimensional conceptual model of corporate performance.*The Academy of Management Review*, 4(4), 497-505.

[10] Massachusetts Institute of Technology. (2011). Sustainability: The 'embracers' seize the advantage. *MIT Sloan Management Revie*w.Retrieved from http://c0426007.cdn2.cloudfiles.rackspacecloud.com/MIT-SMR-BCGsustainability-the-embracers-seize-advantage-2011.pdf.

[11] Deming, W. E. 1967. Walter A. Shewhart, 1891-1967.*American Statistician*.21: 39-40.

[12] Crosby, P. (1979). Quality is Free (New York, McGraw-Hill).

[13] Wheeler, D., (2017). What about p-Charts?. Quality Digest.Retrieved 17 July 2017.

[14] R. K. Burdick, C. M. Borror, and D. C. Montgomery.A review of measurement systems capability analysis.Journal of Quality Technology, 35(4), 342-354, 2002.

[15] Corder, G. W.; Foreman, D. I. (2014). Nonparametric Statistics: A Step-by-Step Approach. Wiley. ISBN 978-1118840313. ISO 26000: Corporate Social Responsibility (2010).

[17] Masaka, D. (2008). Why enforcing corporate social responsibility (CSR) is morally questionable", *Electronic Journal of Business Ethics and OrganizationalStudies*, 13(1), 13-21.

[18] Chandana (Last updated September 11, 2017). *Normality Test in Minitab: Minitab with Statistics*.

[19] Ishikawa, K (1976). Guide to Quality Control. Asian Productivity Organization. ISBN 92-833-1036-5

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