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Application of the QCC Method to NG Dent in the Visual Inspection Process at PT Sugiyama Indonesia

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Abstract
The problem that occurs at PT SUGIYAMA Indonesia is that there are many defects in the inner and outer areas. Defects occur during the process stage or cutting, rolling. So that when the material has reached the visual inspection stage, many types of NG (Not Good) occur, including NG (Not Good) which often occurs based on NG (Not Good) recap data in the last three months of 2024 is NG (Not Good) Dent. Based on the data listed, the percentage of NG (Not Good) Dent increases every month, and the highest defect rate is around 33k pcs of the total NG (Not Good) of the overall model. Therefore, a case study study was conducted using the QCC (Quality Control Circle) method to analyze the occurrence of the defect, and aimed to reduce the number of NG (Not Good) Dent and make the production process better. Based on the data from the research results, the researcher succeeded in reducing NG (Not Good) Dent based on data from the last three months, which had reached 100%, after observations and using the QCC method and its auxiliary tools, namely the cause-and-effect diagram (Fishbone) and the pareto diagram, the percentage in the next two months from November to December 2024, only reached 37%.

Keywords: Fishbone, Quality Standard, QCC, PDCA

Introduction

PT Sugiyama Indonesia is a Japanese manufacturing company that focuses on the export of 3 countries, namely Thailand, Japan and India. This company is engaged in the automotive sector, especially the manufacture of automotive oxygen sensors on electric motorcycles and has been internationally certified, namely ISO 9001.

Every company has standard rules that must be followed by all parties involved, in the visual inspection process at PT Sugiyama Indonesia, there are standard rules that must be obeyed, namely IK (Work Instructions). One of the problems that occurs here is the lack of employee awareness of how important IK is at work, and also the lack of caution when checking the finish good parts, so that during the visual inspection process, many parts fall which can increase the risk of NG (Not Good) Dent. NG (Not Good) Dent can be said to be NG (Not

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Good) Bump. NG (Not Good) Impact itself is a physical defect in a part that experiences unevenness (dents). NG (Not Good) can occur at the top and bottom of the part. It is usually flattened inwards, or outwards.

In this case study research, several methods will be combined including, the QCC method (part of the PDCA cycle), fishbone diagrams, and pareto. This study has the goal of identifying the causes of NG (Not Good) Dent and finding solutions to reduce NG (Not Good).

Visual inspection is a standard method used to check on finished good products, to detect and sort out parts whether the part being checked has defects or is guaranteed to be ok. IK (Work Instruction) is a regulation or work procedure in a company that must be complied with by all parties involved in order to ensure the quality of the products produced. Defects are rejected goods whose condition can no longer be used and do not meet standards.

According to (Hansen & Mowen, 2024) a defective product is a product that does not meet its specifications. The QCC (Quality Control Circle) method is a method that involves several people/teams who function to regulate, supervise, and maintain the sustainability of the work process from the raw material stage to the ready-to-ship goods. According to Prof. Kaoru Ishikawa Quality Control Circle (QCC) is an 8-step quality control system with a continuous improvement system or kaizen.

The PDCA approach is a method that is carried out in stages to identify findings with the aim of obtaining an idea for improvement that will be applied in the future. Fishbone diagram is a method used to analyze the cause of a problem that is identical to fish. This part of the fishbone analysis includes the head of the fish placed on the right end as the main problem. The fins are the group that causes the problem. While the thorns are used to state the cause of the problem.

A Pareto diagram is a diagram that is visualized and can help identify and prioritize problems by sorting them by their importance. Supply chain management according to Chopra and Meindl (2004) is a supply chain management that consists of the involvement of each supply chain, both directly and indirectly to meet customer demand. Kaizen is an improvement that is carried out regularly, not only in the scope of work but covers all aspects.

Method

The method that will be raised in this journal uses a quantitative descriptive method. The quantitative descriptive method is a method that describes how to control product quality, especially in defect dents, by combining observations and using statistical data. The research technique used is the Quality Control Circle method. The flow of the research method can be seen in the flowchart as follows:

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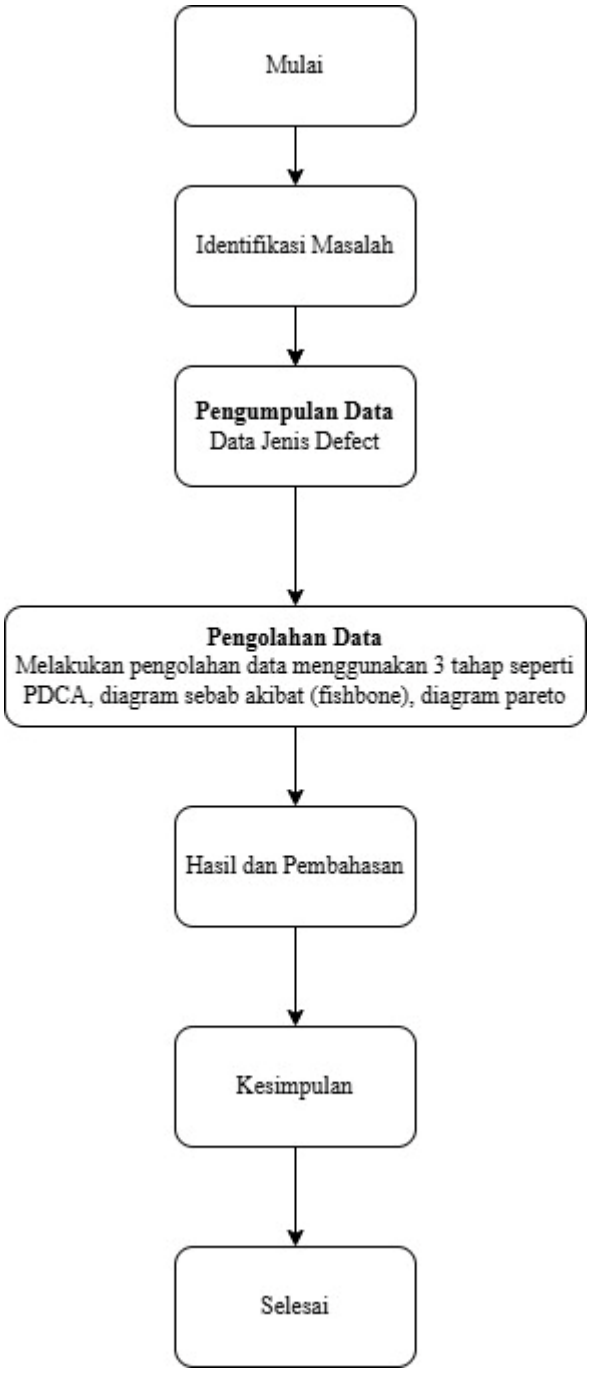

Figure.1: Research methodology Research Data Sources (2021-2022)

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Three tools in the QCC (Quality Control Circle) process:

1. PDCA Approach
    a. In the Plan stage, what is done is to identify the main problems that can affect the work stage process, including finding the root cause of the problem, determining improvement targets, and then solving the problem.
    b. At the DO stage, a kind of improvement trail is carried out on a small scale to find out how likely it is to be effective.
    c. At the Check stage, an examination is carried out using the data from the improvement evaluation. At this stage, tools such as pareto and fishbone diagrams are very necessary.
    d. At the Action stage, if the proposed improvement idea gives satisfactory results, the next step is to determine and then document the new working procedure to maintain the continuity of the improvement process. Thus, the PDCA approach, which includes pareto diagram tools and fishbone tools, can work effectively to increase efficiency and provide the best product quality according to continuous improvement standards.

2. Fishbone diagram is a method used to analyze the cause of a problem that is identical to fish. This part of the fishbone analysis includes the head of the fish placed on the right end as the main problem. The fins are the group that causes the problem. While the thorns are used to state the cause of the problem.

3. A Pareto diagram is a diagram that is visualized and can help identify and prioritize problems by sorting them by their importance. Using pareto diagrams, we can find problems that have the highest level of importance and must be solved immediately (highest ranking), as well as problems that do not have to be solved immediately (lowest ranking). In addition, Pareto diagrams can also identify problems that have the greatest impact on quality improvement efforts. To prevent losses and maintain the safety and health of workers, it is important to evaluate the failures that occur. In this case, failure analysis is a necessary step. By conducting a failure analysis, the main cause of failure can be identified and appropriate steps can be taken to prevent it from happening again in the future (Nurjanah et al., 2023).

Results and Discussion

Supply chain process

In this process, the first flow is materials imported directly from PT Sugiyama Indonesia in Thailand, the second process, from the raw materials is processed into stainless steel wire (a material consisting of iron/nickel/carbon formed into wire). After that, the iron wire is formed according to the finished goods through the cold forging stage. After the material is cold forged (forging), then there is a passivate process, which is the prevention of corrosion on the iron parts. Then enter the cutting stage, then rolling. In the rolling process, the workpiece in the form of a slab or plate is compressed into two rolls that rotate towards the workpiece, so that its thickness is reduced. The rotating roll will press the workpiece plate with the final

product in the form of a sheet. After the rolling process, it is then submitted to the QC department for visual inspection, then the last stage is shipping (products are ready to ship).

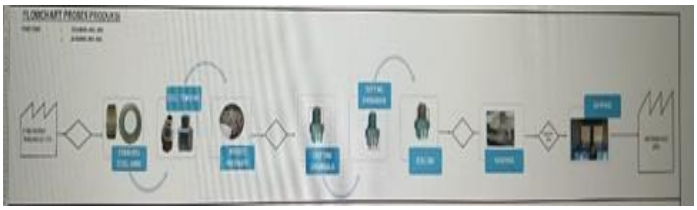

Figure 2: Production Process Flow

In part s4, it has the following specific sizes:
1. Upper Area, has a diameter of 12.8 mm
2. Middle Area, has a diameter of 12.8
3. Bottom Area (Thread), has a diameter of 7.3 mm

Fig.3 : Part S4 Finish Good3

The data recap obtained based on the results of observations is in the form of total NG (Not Good) data in the last three months, August-October 2024.

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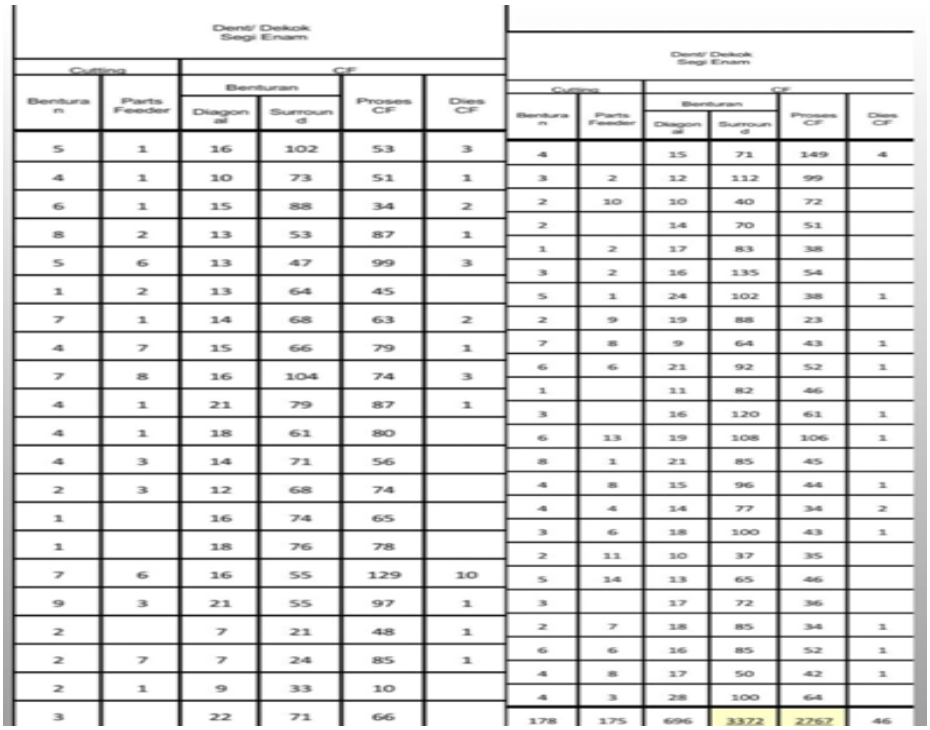
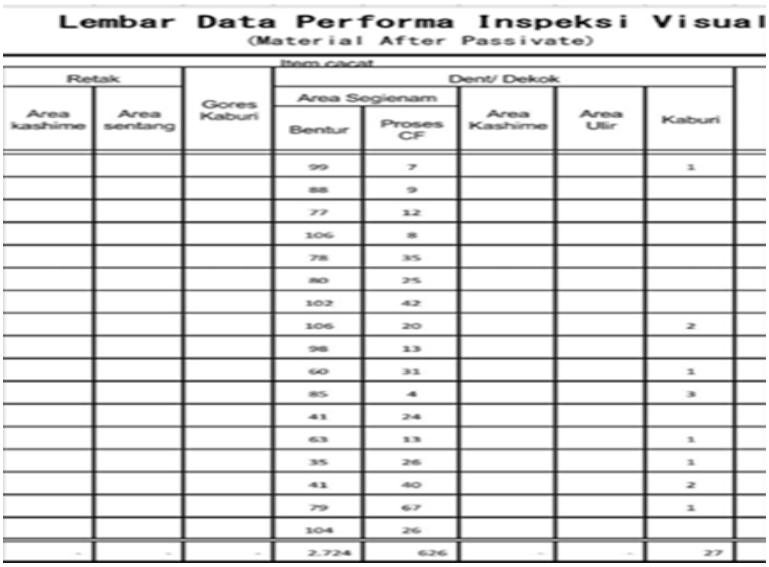


Dent/ Dekok Segi Enam					
Cutting		CF			
Bentuan	Parts Feeder	Benturan		Proses CF	Dies CF
		Diagonal	Surround		
5	1	16	102	53	3
4	1	10	73	51	1
6	1	15	88	34	2
8	2	13	53	87	1
5	6	13	47	99	3
1	2	13	64	45	
7	1	14	68	63	2
4	7	15	66	79	1
7	8	16	104	74	3
4	1	21	79	87	1
4	1	18	61	80	
4	3	14	71	56	
2	3	12	68	74	
1		16	74	65	
1		18	76	78	
7	6	16	55	129	10
9	3	21	55	97	1
2		7	21	48	1
2	7	7	24	85	1
2	1	9	33	10	
3		22	71	66	

Dent/ Dekok Segi Enam					
Cutting		CF			
Bentuan	Parts Feeder	Benturan		Proses CF	Dies CF
		Diagonal	Surround		
4		15	71	149	4
3	2	12	112	99	
2	10	10	40	72	
2		14	70	51	
1	2	17	83	38	
3	2	16	135	54	
5	1	24	102	38	1
2	9	19	88	23	
7	8	9	64	43	1
6	6	21	92	52	1
1		11	82	46	
3		16	120	61	1
6	13	19	108	106	1
8	1	21	85	45	
4	8	15	96	44	1
4	4	14	77	34	2
3	6	18	100	43	1
2	11	10	37	35	
5	14	13	65	46	
3		17	72	36	
2	7	18	85	34	1
6	6	16	85	52	1
4	8	17	50	42	1
4	3	28	100	64	
178	175	696	3372	2767	46

Figure 4: NG (Not Good) Dent Data for August 2024

In August 2024, the total number of NG (Not Good) in 1 model, namely the S4, reached 7,234 pcs.



Lembar Data Performa Inspeksi Visual
(Material After Passivate)

Item cacat							
Retak		Gores Kaburi	Dent/ Dekok				
			Area Segienam		Area Kashime	Area Ulir	Kaburi
Area kashime	Area sentang		Bentur	Proses CF			
			99	7			1
			88	9			
			77	12			
			106	8			
			78	35			
			80	25			
			102	42			
			106	20			2
			98	13			
			60	31			1
			85	4			3
			41	24			
			63	13			1
			35	26			1
			41	40			2
			79	67			1
			104	26			
-	-	-	2.724	626	-	-	27

Figure 5: NG (Not Good) Dent Data for September 2024

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In September 2024, NG (Not Good) Dent experienced a slight decrease, which was in the range of 3,350 pcs. Although it has decreased, when compared to other models, NG (Not Good) Dent is still the largest producer of NG (Not Good).

M. Oct Y. 2024

No. Part : 0Z-AS0001-001 (S4)

Tgl Periksa	No. Lot				No MC CLV	Dent/ Dekok Segi Enam					Dent/ Dekok pada Shelf
						Parts Feeder	CF				
							Benturan		Proses CF	Dies CF	
							Diagonal	Surround			
	S4	MHL	3X17	421	1		13	56	142	22	
30	S4	MHN	9X21	423	1	2	22	70	99	8	
	S4	MHP	5X21	424	1	11	10	53	89	4	
	S4	LZU	4618	421	2	3	11	68	28		
31	S4	MHH	4X16	318	1	1	19	67	42	4	
	S4	MHM	4X21	422	1	2	16	42	72		
	S4	MHR	3X22	428	1	9	16	81	71	7	
	S4	MHS	4X23	328	1	1	7	45	110	2	
Total						139	653	2646	2895	312	10

Figure 6: NG (Not Good) Dent Data for October 2024

In October 2024, there was a slight increase in a total of 6,645 pcs. Next, the data processing stage with 2 Quality Control Circle tools. The following are the results of data processing with two Quality Control Circle tools, including:

Diagram Fishbone

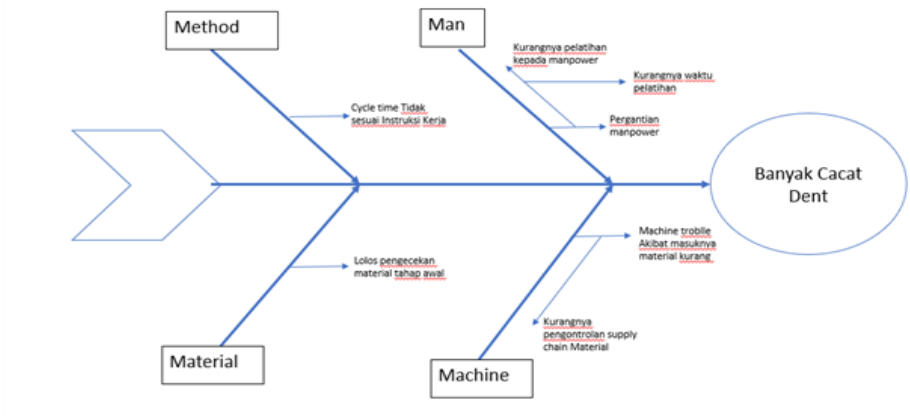

Figure 7 : Factors Causing NG (Not Good) Dent.

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Description from the diagram above:

1. Man (Operator)
   When operators are always changing, PPIC/Management Section must always provide training such as training and so on. The main cause is the change of man power in a short period of time. In addition, the lack of training provided is due to the number of pen training that tends to be small and time constraints, as a result of which the skills possessed by new man power are very minimal.

2. Machine
   Lack of control in the material supply chain process, so that the machine often experiences problems. In addition, the engine distance factor is also very influential to produce NG (Not Good) Dent (Impact). The distance of the machine should be made higher so that when the material that wants to enter the visual inspection process does not have many impacts.

3. Material
   After the cold forging stage, usually the part will be taken first to the visual inspection section to be checked at a glance so that when it is at the finish good stage, not many NG (Not Good) will pass. From here, it is what causes many good finish parts to experience NG (Not Good)
4. Methode
   If you look at the checking method, the period of time to check one part is 2 seconds according to IK. Even so, there are still many operators who underestimate the matter of checking only the top part, aka not really checking the bottom part.

Diagram Pareto

Figure 8: NG (Not Good) Dent Recap in Pareto

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It	Moon	Category NG	Total production	Part OK	Part NG	NG Presentation
1	August	Dent	76800000	76792766	7234	37%
		Burry				15%
		Scracth				10%
		Stain				5%
		Kaburi				5%
2	September	Dent	64000000	63996650	3350	31%
		Burry				12%
		Scracth				7%
		Stain				4%
		Kaburi				3%
3	October	Dent	67200000	67193355	6645	32%
		Burry				14%
		Scracth				12%
		Stain				5%

Table.1: Percentage of NG (Not Good) Dent

Based on the data in the table, the percentage of NG (Not Good) Dent in August 2024 reached 37%, then in September 2024 around 31%, October 2024 around 32%. In total, the percentage of NG (Not Good) Dent reaches 100%.

Improvement Analysis

Weekly & Monthly Meetings

This discussion is carried out regularly by people from the management department along with PPIC and leaders.

a) Monthly Training

This monthly training is mandatory. All inspection operators must be trained one by one with a predetermined time according to the actual check, and there must be no NG (Not Good) pass.

b) Kaizen

A form of discipline for Japanese universities is to carry out kaizen. According to Khan (2011:181-182) Kaizen "is based on the belief that people who do certain jobs will become more knowledgeable than others, including their superiors. The meaning of kaizen itself is improvements that are made regularly, not only in the scope of work but covering all aspects. This kaizen must also be complied with by all parties involved, especially inspection operators. Example case: there is an NG (Not Good) part that passed and was caught in the QC Outgoing NG (Not Good) Dent. So, all inspection operators must make a kaizen as to why there can be a pass.

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After repairs are carried out

Table. 2: Percentage After Improvement November 2024

November 2024	% NG (Not Good)
Dent	20%
Burry	12%
Scratch	10%
Stain	3%
Kaburi	4%

Table. 3: Percentage After Improvement December 2024

December 2024	% NG (Not Good)
Dent	17%
Burry	10%
Scratch	9%
Stain	4%
Kaburi	3%

Conclusion

Based on the data, researchers have succeeded in reducing NG (Not Good) Dent based on data from the last three months, which previously reached 100%, after observation and using the QCC method and its auxiliary tools, namely causal diagrams (Fishbone) and pareto diagrams, the percentage in the next two months from November to December 2024, only reached 37%.

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