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Productivity improvement kaizen of XC-60 housing

Akash Salokhe[1], Nishank Shah[2], Tejas Godalkar[3], Sumit Dahule[4] , Prof. Pravin Ingale[5]

BE Student ,Prof. at Dept. of mechanical engineering,Dept. of Mechanical Engineering ,Dr.D.Y.Patil institute of technology, Pimpri, Maharashtra, India

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Abstract - *Industries suffer from poor quality and productivity due to large number of process parameters. Casting defects are concerned and caused with process parameters. Therefore, by controlling these parameters we can produce a defect free product. One should know the processes and their parameters and should have depth in knowledge of those for controlling these casting parameters and reduce the defects. Various researchers have researched and studied to minimize the defect by using process improvement tools like KAIZEN, Six Sigma, etc. This Paper prescribes comprehensive review of work pertaining to process improvement techniques used for defect minimisation in XC-60 casting.*

Key Words: kaizen, DMAIC, Productivity, fixture, cycle time

1. INTRODUCTION

The project deals with the productivity improvement of XC60 housing, which is an Aluminium Die Casted product. The product is made from aluminium A413. The product's faces are divided in three classes according to customer's demand class A, class B and class C. The product has lugs on class B side, which are small in size. It also has slider fitment attachment with two M4 holes. A class surface has four core two on each side.

1.1 KAIZEN

Kaizen is Japanese quality improvement philosophy where kai-good and Zen denotes changes .kaizen aims to create a quality oriented culture. Various activities, in kaizen are Kanban, JIT, TPM, etc.

1.2 PRODUCTIVITY

Productivity, a productivity measure is defined as the ratio of output to inputs used in a production process, i.e. output per unit of input. Productivity measure are quantitative and easy to measure .It is also define as rate at which goods are produced.

Types of Productivity:

1. Labor productivity.
2. Capital productivity.
3. Material productivity

Labour productivity: It is defined as Total output per labour inputs.

Capital productivity: It is defined as Total output per capital input.

Material productivity: It is defined as Total output per material input**.**

1.3 DMAIC

The obstacles raised in the project are solved using DMAIC methodology. The DMAIC project methodology has five phases:

- Define the system, the voice of the customer and their requirements, and the project goals, specifically.
- Measure key aspects of the current process and collect relevant data; calculate the 'as-is' Process Capability.
- Analyse the data to investigate and verify cause-and-effect relationships. Determine what the relationships are, and attempt to ensure that all factors have been considered. Seek out root cause of the defect under investigation.
- Improve or optimize the current process based upon data analysis using techniques such as design of experiments, Poka yoke or mistake proofing, and standard work to create a new, future state process. Set up pilot runs to establish process capability.
- Control the future state process to ensure that any deviations from the target are corrected before they result in defects. Implement control systems such as statistical process control, production boards, visual workplaces, and continuously monitor the process.

2. PROCESS FLOW:

1. **Melting:** The raw material is in furnace. While heating the material is also de-oxidized. Removal of sludge and impurities.
2. **Die Casting:** The XC60 is cold chamber die casted product.

3. **Trimming:** Trimming is the process of gate removal from the product. A trimming fixture is used for the purpose. Air gun is used to remove the extra material from the bed, which can damage the product.
4. **Belting:** In belting the gate remains is belted and removed from the product.
5. **Fettling:** In fettling all the flashes, extra remains, projections, etc. are removed from all the surfaces of the product by using polish paper, noga cutter and files.
6. **Sandering:** All the surfaces of the product are sandered with the help of pneumatic sandering machine and made clean for shot blasting and machining.
7. **Machining:** The product contains two M4 tappings and some profile on C class surface, which are machined on VMC.
8. **Shot Blasting:** In shot blasting the product is bombarded with SS media with very high velocity o give high quality surface finish.
9. **Inspection:** In this, the products are inspected for each and every defect. The products which can be improved are sent for rework.

3. ANALYSIS FOR 100 SAMPLES:

Before proceeding ahead, it was important to segregate and separate the major defects. For that an analysis of 100 sample products was done. From the Pareto chart and 80/20 rule it was observed that major defects were Blackmarks, Dents, Flaking, Oil mark, Flashes. From revised data of next few months, it was found that M4 gauge not pass, Glue mark and slider flashes were added in the majority defects.

Major Defects found:

1. Dents
2. Blackmarks
3. M4 gauge NOT PASS
4. Slider NOT OK
5. Glue marks

3.1.Changes made to improve productivity quality wise:

1) Implementation of second cooling fan at casting area to reduce rejection due to dents.
2) Introduction of inspection unit after fettling and sandering. Introduction of inspection cell reduces the cost of machining and shot blasting. The rework was also reduced simultaneously.
3) Die modifications for reducing flacking / black mark.
4) Design of fixture for cleaning of media in the M4 taps.(fig.1)
5) Design of tool to remove the flashes efficiently and effectively.
6) Modifications in die to avoid the defect in casting only
7) Introduction of isopropyl cleaning to remove glue marks.

3.1. Changes made to improve productivity quantity wise:

1. The bottle neck process found is fettling, so to increase the capacity and reduce the efforts pneumatic slider flash removal fixture is introduced.(fig.2 and fig.3)

2. In sandering process the sander paper was not utilized properly and maximum portion of the paper got wasted, so for waste reduction it was suggested to use sandpaper in semicircular pattern.

3. After fettling, inspection cell was introduced to avoid further defects flow.

4. Introduction of two way slider for increasing quantity.

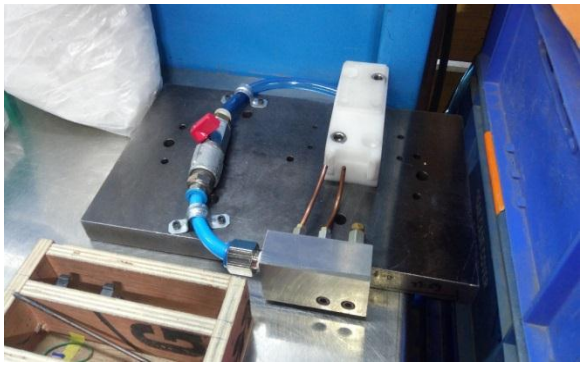

Fig:.1 Actual model of air gun fixture

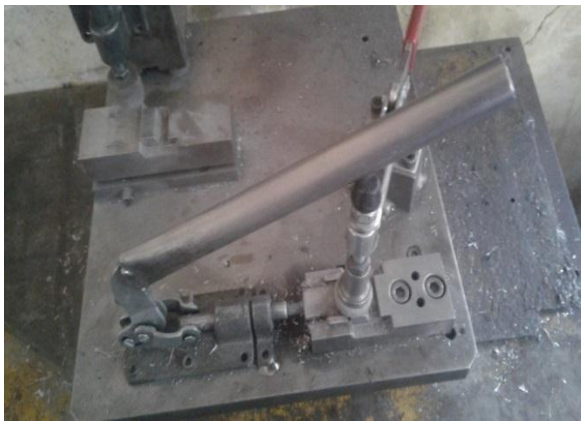

Fig2: Previous Slider cutter tool

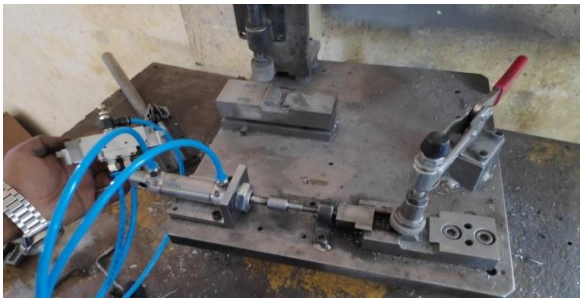

Fig 3: Pneumatic Slider cutter tool

Table1 : Comparison of before and after rejection

Rejection percentages		
Defect	Rejection percentage (before)	Rejection percentage (after)
Dents	12.15	9.5
Blackmarks/ flacking	23.96	11.76
M4 gauge NOT PASS	22.3	0
Slider NOT OK	8.7	0
Glue marks	7	0

Table -2: Comparison for change in productivity

	CYCLE TIME	
Content	Before	After
Manpower Plan	70.97	48.41
Machine Operators	70.97	48.41
Total manpower	71	48
Tonnage	1976	1976
Productivity	87	128

4. CONCLUSIONS

- Designed a slider fixture for cycle time reduction.
- Found the bottleneck operation (machining and fettling).
- Ideas for implementation of kaizen on some of the processes.
- Changes made in die for reducing defects like black mark, slider, etc.
- Glue mark defect solved.
- M4 defect solved.
- Slider not ok defect solved.

REFERENCES

[1] Pyzdek T, Keller PA (2009), —The Six Sigma handbook||, 3rd Edition McGraw-Hill, New York

[2] Pande, P., Neuman, R., and Cavanagh, R. (2000), —The Six Sigma Way: How GE, Motorola and Other Top Companies are Honing their Performance||, (McGraw-Hill, New York

[3] Abdolshah, M. and Jahan, A., "How to Use Continuous Improvement Tools in Different Life Periods of Organization", *IEEE International Conference on Management of Innovation and Technology*, Singapore, June 21–23, 2006, Vol. 2, pp. 772–777.

[4] Thomas Staeblein, Karauli Aoki et al., Planning and scheduling in the automotive industry: A comparison of industrial practice at German and Japanese makers (2012).

[5] Satish Tyagi, Alok Choudhary, Xianming Cai, Kai Yang et al., Value stream mapping to reduce the lead-time of product development process (2014).

BIOGRAPHIES

MR. AKASH TUKARAM SALOKHE
Student at Dr. D.Y Patil institute of technology ,pimpri

MR. NISHANK NITIN SHAH
Student at Dr. D.Y Patil institute of technology ,pimpri

MR. TEJAS RAMCHANDRA GODALKAR
Student at Dr. D.Y patil institute of technology ,pimpri

MR. SUMIT SADHASHIV DAHULE
Student at Dr.DY Patil institute of technology ,pimpri

MR. PRAVIN INGALE
Proffesor at Dr.D.Y Patil Institute of technology pimpri