

# CAUSE ANALYSIS OF RING BEARING GRINDING CRACKS USING ISHIKAWA DIAGRAM

## АНАЛИЗ НА ПРИЧИНИТЕ ЗА ПУКНАТИНИТЕ ПРИ ШЛЯЙФАНЕ НА ПРЪСТЕНОВИДЕН ЛАГЕР С ИЗПОЛЗВАНЕ НА ДИАГРАМАТА "ИШИКАВА"

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**Abstract:** Analysing quality control tools are used for serving on the quality of data collection, processing, interpretation and use. Such work tools are part of information system quality. One of these tools work available to the specialists, is the cause and effect diagram. The cause-effect diagram or the Ishikawa diagram chart named also the "fishbone" has two parts: one part to another part of the cause and effect. In the preparation of these charts is recommended to use a team to ensure a better precision analysis, creating such a brainstorming session.  
**KEY WORDS:** QUALITY, CHART, BRAINSTORMING

### 1. Introduction

Ishikawa diagram is a method to systematically identify potential causes.

The causes listed above are the factors that influence the quality characteristics that it must be realized in the process (size, hardness, appearance, percentage of defective parts, etc..) and which normally is the effect. [1, 2, 3].

Pruteanu [4] illustrates the cases that can be classified according to their importance in major causes, causes secondary, tertiary, etc., On different levels of importance, similarity graphic representation of a skeleton is over.

In the figure below we present a schematic representation of the connection that can exist between cause and effect:

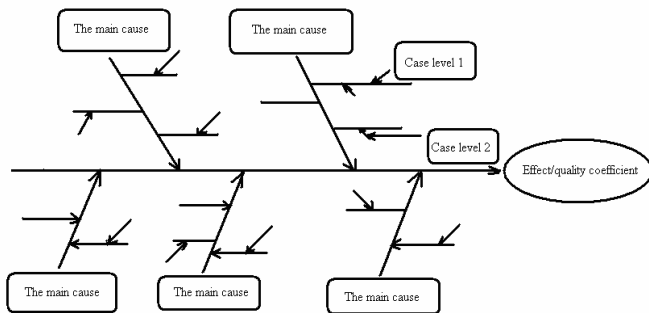


Fig. 1. Schematic representation of the causal link effect [4]

### 2. Types of cause and effect diagram (Ishikawa)

In practice quality control were imposed on various types of Ishikawa diagrams, which differ in the structure, how to organize and systematize the causes, or purposes for which uses diagrams. According to Gramescu [1] we present the following classification of diagrams:

- **Charts structured component of the process** - that can be use for analysing dispersion characteristics of quality structured stages, steps, operations, phases, activities, sequences of the classification process for production processes. These charts are grouped causes major system component technology in the general case on the "6 M". Each of these categories of cases can be operated in one or more secondary diagrams characterized by a greater detail. Key benefit of this type of diagram is that deviations of the dispersion behaviour as characteristic of various causes help in the systematic and relationship factors dispersion. A representation of this type of diagram we have represented in Figure 2:

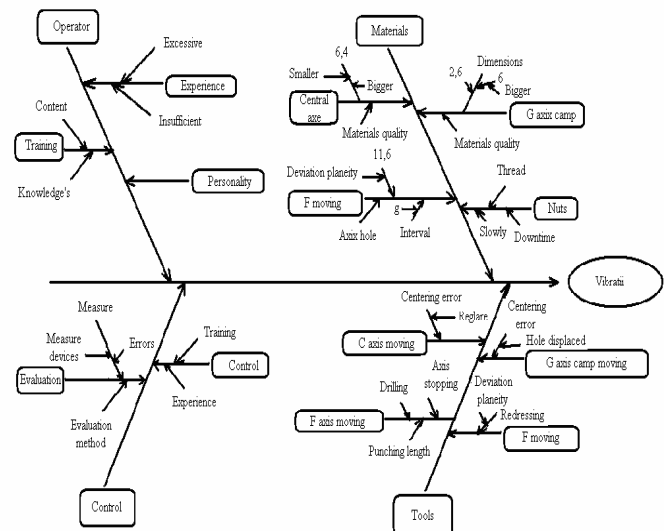


Fig.2. Diagram structured component of the process [2]

- **Structured chart on stages of the process** - are used for classification of production processes. This type of diagram (arrow) follows the classification of the main production processes and all causes that can affect accuracy is attached properly stage of the process, operations, those phases. As dispersion characteristic as occurs during the production process, must go through each stage of the process to detect cases. Key benefit of this type of diagram is that, giving the sequence of stages, phases, stages are easy to prepare and process it. A shortcoming, however important, is that a number of similar cases occurring several times and that the cases corresponding combination of several factors are difficult to represent. Representation of a diagrams of cup type of diagram you found in Figure 3:

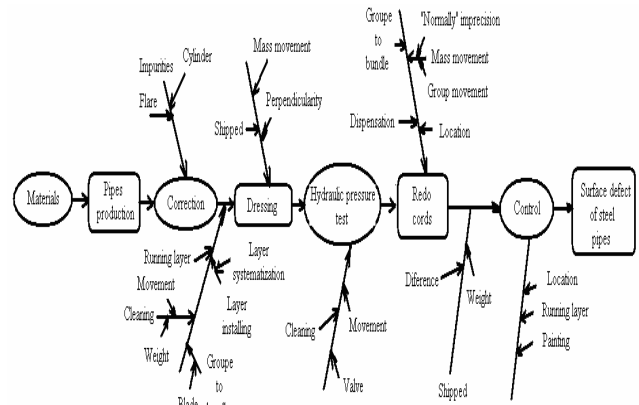


Fig.3. Structured chart on stages of the process [2, 3]

- **Structural diagrams** - these charts are reduced to a list which lists all possible causes. For this purpose it is necessary to make data collection from all staff involved in the process of manufacturing the product. It is good that these cases be identified and then organized, indicating which is the connection between cause and effect - evidencing feature of the product, thus obtaining a real Ishikawa diagram, it can resemble the dispersion analysis. The advantage of this type of diagram is that it is not neglected any possible cause. In order to draw such diagrams is difficult reference to secondary causes, so that may be difficult to build.

### 3. Ways of preparation of charts Ishikawa

Drawing up a chart of this, Ishikawa, it is not a simple problem. For its preparation to be as conclusive Gramescu [4] shows that it is necessary to establish clearly who is objective analysis, concluding effect and then begins to identify the causes that produce it.

A special importance at the elaboration of such diagrams is to apart clearly the cases of corrective measures implemented. It was noted that there are several ways of drawing diagrams Ishikawa. If found, after collection, as there is variation depending on the quality characteristics of a particular case, there must be a question regarding the existence, that is a variation of the effect, that the quality characteristic is created by variation of factors - causes, which lead.

The methodology for drawing structured diagrams component of our process is Tarau proposed by [2] and consists of the following steps:

It establishes quality characteristics that we want to improve or keep it under control. To eliminate the defects, you must identify the causes;

- The feature writing as to the right side of a sheet of paper and is framed in a rectangle;
- Plot the main line from the left to the right, the arrow can be doubled;
- It says, in succession, the main reasons (which may be in the 5 "M") and that influence quality characteristics. The main causes are also framed in the rectangle. Setting cases, from those starting with an arrow will be bends, branches. The group recommended a large number of possible causes of dispersion. In each of these branches will be written in the following stage, causes - factors detailed, forming twigs. Identifying causes of quality variation of the dispersion characteristics can be facilitated by make and give answers to successive questions: why, how groups influence the dispersion causes? If the chart is drawn up by members of a quality circle for individualization of cases, we can use brainstorming method. Possible causes of the dispersion characteristic of quality must be emphasized, in the diagram, that all reciprocal links will be clear.
- To establish and to write clearly secondary causes leading to the main causes, it is making on the basis of an analysis of variation of quality depending on the root causes and the ramifications are for average;
- Establishing and write tertiary cases, they directly influence the secondary causes, making operation is based on research quality characteristic variation depending on secondary causes, representing as small branches;
- Establishing and write causes that influence tertiary cases;
- To determine whether there were any possible causes of dispersion induced characteristic quality;
- It marks the important particular cases, which have a significant effect on the quality characteristic.

After listing these steps, careful analysis of their results in a series of observations that can be made:

- Ishikawa diagram, resulting from browsing stages, is very complicated, with many branches - branches. Such a chart is considered effective and reflects the deep knowledge of manufacturing process;

- If, contrary to what is said above, a chart has few branches, it reflects the superficial knowledge of the process and so the diagram can be considered good;
- After setting a priority in solving the cases, appropriate measures should be established to remove these causes. It is very important following the application of verification measures and their effectiveness.

### 4. Model illustration

The analysis that we make will be done on a technological flux correcting type axial bearing rings, radial bearings, oscillating and cylindrical. After correcting the appearance of burns I made an Interdepartmental Team for analysis of the causes and how to eliminate them. Following a qualitative assessment of the possible causes we have structured in an Ishikawa diagram.

Causes of Fishbone diagram was evaluated and prioritized by team members, thus forming a cause-effect matrix.

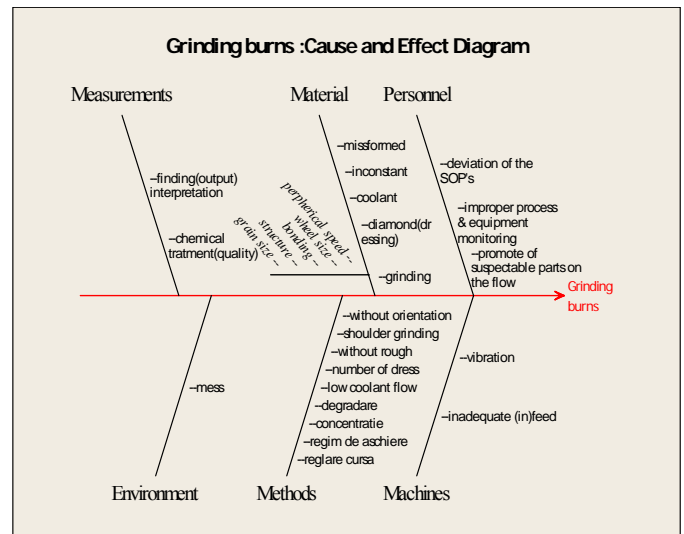


Fig.4. Ishikawa diagram with the root causes found in cracks of correction

Following the analysis of cause-effect matrix only some of these possible causes have been selected for further investigation, considering the other is that no significant impact (according to points earned).

### 5. Results and discussions

#### Test 1

#### The aim:

- identifying influential addition of processing and determining the optimal addition

#### Test conditions:

Near: 604533-0214

Operation carried out: correction collar side

Type machine: NOVA PGE10/150

Type Stone: 5A 80K 8VHY Baystate

Diamond Type: SP1 0.3 kt reconditioned

Diamond speed: 0.75 m / min

Diamond after each processed ring

Compensation wears diamond stone: 0.02 mm

Stone peripheral speed: 35m / s

Speed device: 370rot/min

Ring peripheral speed: 43 m / min

Advance work: the same for all groups

Actual working cycle (no power): 7.5 sec, 12.5 sec, 15.5 sec (in accordance with the difference added, keeping the same advance)

**Emulsion:**

- type: Relubro TRM in individual basin
- concentration: 3.5%
- flow: 10 l / min

**Added processing:**

- 3 different batches with added processing 0.1mm, 0.2 mm and 0.35 mm

**Progress test mode:**

Were processed for 3 lots of 20 rings each groups were sorted in thickness collar, the difference between groups was only the addition of processing time. Batches were processed sequentially in the same conditions, the difference between them being only the addition of processing. To process a single collar, so technological base remained the same after the processing has been carried out pickling 100%

Tab. 1. The obtained results of the test 1

No. lot	Added processing size [mm]	Total pieces handled	No. good pieces	No. burned pieces
I	0,1	20	12	6 easily burned 2 burned the entire surface
II	0,2	20	20	0
III	0,30	20	16	4 easy burned (vibrated)

**Test 2****The aim:**

- identifying influential type of emulsion and if it is a significant factor correcting burns

**Test conditions:**

Landmark, schemes of work, test conditions and test how strictly those of test 1, only difference is the type of emulsion used

**Emulsion:**

- type: Castrol Synthilo RHS in individual basin
- concentration: 3.5%
- flow: 10 l / min

Tab. 2. The obtained results of the test 2

No. lot	Added processing size [mm]	Total pieces handled	No. good pieces	No. burned pieces
I	0,1	20	7	13
II	0,2	20	17	3(easily vibrated)
III	0,30	20	18	2 easy burned (vibrated)

No. lot	Corrigendum page to share group I (= final rate +0.2 mm)	Corrigendum to share group II (= final rate +0.1 mm)	Corrigendum to share group III (= The final)
I	13 good 7 burned	20 vibrated (traces of burns in the form of vibrations)	2 vibrated 18 burned
II	----	17 good	2 vibrated 12 burned
III		3 burned (slightly vibrated)	2 vibrated 1 burn

**Test 3****The aim:**

- identifying influential vibration equipment and cutting stone ring system, and the influence of body rigidity abrasive

**Test conditions:**

Landmark, schemes of work, test conditions and test how strictly those of test 2, the difference only replacing the abrasive body with one of the same type but with a thickness of 30 mm compared to 12 as was previously and correct flat body abrasive .

**Emulsion:**

- type: Castrol Synthilo RHS in individual basin
- concentration: 3.5%
- flow: 10 l / min.

Tab.3. The obtained results of the test 3

No. pieces	Added processing	Results obtained after etching
10	0,3	10 OK
50	0,3	50 OK
10	0,1	10 OK

**Test 4****The aim:**

- to determine the influence of the central emulsion processing plant

Tab.4. The obtained results of the test 4

No. pieces	Added processing	Results obtained after etching
20	0,3	13 burned; 7 vibrated

**Test 5****The aim:**

- Finding an emulsion of options for improving central installation

**Test conditions:**

Id test 4, but the emulsion used was improved.

Tab.5. The obtained results of the test 5

No. pieces	Added processing	Results obtained after etching
50	0,3 (ring machined to final listing)	50 Ok (12 easy vibrated in the form of chips)

## **6. Conclusions**

As you can see, from the release of results, causes major determinant in the appearance of cracks are: the addition of processing, type of emulsion used, vibration equipment and cutting stone ring system, and the influence of the abrasive body rigidity. It was noted that most defective parts such as grinding cracks appearing in collars side of oscillating rings or cylindrical type. As you can see, a test was clearly shown to be key factors that influence the occurrence of cracks and which measures are necessary to remove the appearance of this defect.

## **7. References**

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