

Modified Process Of Manufacturing Split Cam Using Vtc Fixture And Grinding Fixture

Deepak K P, Dr. D Ramegowda

(1st Affiliation) Research Scholar, Mechanical Department, KVG College of Engineering, Sullia, Dakshin Kannada, Karnataka, India ;

(2nd Affiliation) HOD, Mechanical Department, KVG College of Engineering, Sullia, Dakshin Kannada, Karnataka, India.

Email: deepakp123@gmail.com

ABSTRACT: Aim of my project work is to submit a Modified process for manufacturing split cam. This split cam is a part that used in printing machine which helps in feeding of pages into printing machines. This split cam is fitted on both sides of the impression cylinder. This project work is carried out at HMT Machine Tools Ltd, Kalamassery, Ernakulam, Kerala. In existing design manufacturing engineers had founded some weariness increase on process in the existing cam profile. So in this project, I rectified the failure and causes. I have changed the whole process with designing suitable fixtures for the production of split cam. The processes of Hardening has been carried out on Split cam which helps to reduce the weariness.

Keywords: Component; Formatting; Style; Styling; insert (keywords)

1 INTRODUCTION

Aim of my project work is to submit a Modified process for manufacturing split cam. This split cam is a part that used in printing machine which helps in feeding of pages into printing machines. This split cam is fitted on both sides of the impression cylinder. This project work is carried out at **HMT Machine Tools Ltd, Kalamassery, Ernakulam, Kerala**. In existing design engineers had founded some weariness increase on process in the existing cam profile. So in this project rectified the failure and causes. We have been changed the whole process with designing suitable fixtures for the production of split cam. The process of Hardening has been carried out on Split cam, which helps to reduce the wear.

1.1 SPLIT CAM

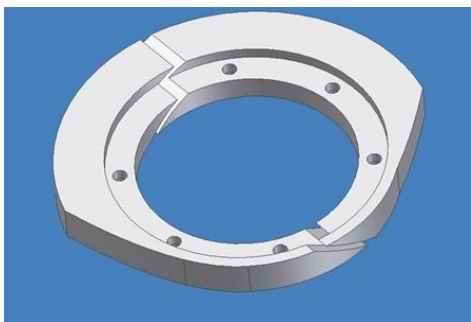
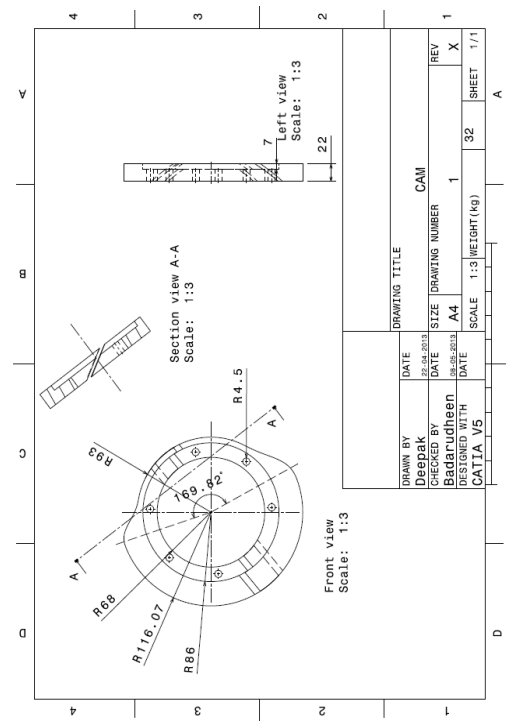


Figure 1.1 : Split cam

Split cam is a mechanical part that used in offset printing machines, which helps to activate the feeding mechanism of pages into printing machines. This split cam is fitted on both sides of the impression cylinder. Formerly this split cam is manufactured with medium carbon steel.



1.2 EXISTING PROCESS AND ITS SPECIFICATION

Table 1.1: Existing process and its failure

Sl. No.	SECT.	MACH.	DESCRIPTION OF OPERATION	SPECIAL TOOL
1	M128	202	CUT OFF Cut off 26 mm length./piece	
2	P255	126	TURN Face both sides to 22.2 mm length. Turn $\phi 233.3 \times 22$ mm length. Trepan & bore $\phi 136 \times 22$ mm length. Step bore $\phi 171.5 \times 7$ mm depth	
3	M253	058	TOUGHEN Harden and temper to 70-	

			80 kg/mm ²	
4	M253	793	SAND BLAST	
5	P255	543	INT. GRIND Grind step $\phi 172 \pm 0.02 \times 7$ mm length. Grind face $\phi 172 / \phi 136$ Grind face $\phi 233 / \phi 172$ to dim. 7	
6	P251	531	SUR. GRIND Grind 2 nd side to 22th	
7	P251	531	CYL. GRIND Grind $\phi 232.74 \pm 0.02 \times 22$ mm length.	Fixture AY52512843
8	P255	453	R.DRILL drill 6 holes $\phi 9 \times 22$ mm length. Counter bore $\phi 14.5 \times 8.2$ mm depth	Drill jig AY04323542
9	P255	070	FITTING Deburr hole ends	
10	P261	484	VTC Mill cam profile over 177.054°	
11	P255	070	FITTING Deburr sharp edges Punch comp. no. & identification on pair	
12	P251	213	H.MILL slit the item into 2 pcs. Through middle at 30°	AY22041441
13	P255	070	FITTING Deburr sharp edges Polish cam profile	
14	M253	053	SURSULF Sursulf to 420 hv	

6	VTC Mill cam profile over 177.054°	
7	CARBURISING & ANNEALING	
8	SAND BLASTING	
9	TURNING Face both sides to 28mm to 22.2mm Trepan & bore $\phi 130$ h7 to $\phi 135.5$ Step bore $\phi 171.5 \times 7$ mm depth.	
10	RADIAL DRILLING Drill 6 holes $\phi 9 \times 22$ mm lengths. Counter bore $\phi 14.5 \times 8.2$ mm depth.	
11	FITTING Deburr sharp edges	
12	HORIZONTAL MILLING Slit the item into 2 pieces through middle at 30°	Fixture AY22041441
13	HARDENING	
14	INTERNAL GRINDING Grind step $\phi 172 \times 7$ mm depth. Grind face $\phi 172 / \phi 136$ Grind face $\phi 233.14 / \phi 172$	
15	SURFACE GRINDING Grind 2 nd side to 22 th	
16	CYLINDRICAL GRINDING Grind $\phi 232.74 \pm 0.02 \times 22$ mm lengths.	
17	FITTING Deburr sharp edges Polish cam profile	

Formerly the split cam is specification is as shown in the table 1.1. After the sursulf process gets affected some dimensional variation will occur in the surface of the cam. So to make the cam as in dimensional some grinding work has to be done on the inner and outer surface of the cam. During the grinding processes which will reduce the thickness that deposited on the surface during sursulf process (i.e; sulphur content). It leads to decrease the wear resistance of the cam and it results in low life cycle of the cam. In the Printing Machine Division [PMD] section, several types of cams are used for printing machine. In all split cams are used in the manufacturing process is same as shown above procedure thus the same failure occurs in all split cams. Further it is decided to select one new cam design.

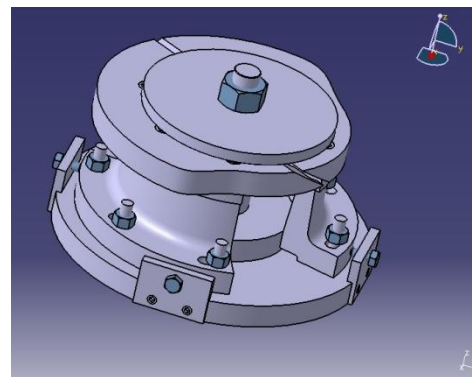
1.3 MODIFIED PROCESS AND ITS SPECIFICATION

Table 1.2: Modified process

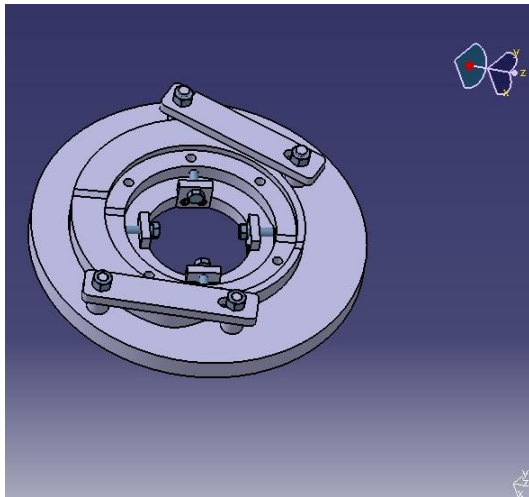
OPN	DESCRIPTION OF OPERATION	SPL. TOOL
1	CUT OFF Cut off 33 mm length./piece	Remark
2	TURN Face both sides to 28 mm Turn $\phi 233.44 \times 28$ mm lengths. Trepan & bore $\phi 129.5$	
3	INTERNAL GRINDING Grind face $\phi 129.5$ to $\phi 130$ h7	
4	CYLINDRICAL GRINDING Grind $\phi 233.14$	
5	FITTING Deburr sharp edges	

In old process the material selected for manufacturing was medium carbon steel [C1] but in this new process we changed the material to low carbon steel [C2]. It's because that by using low carbon steel we can add more carbon content to the cam by heat treatment process. After drilling operation we split our work with horizontal milling machine, but in the former process the splitting is done as the last process. So it's very difficult to for processing cylindrical and grinding operations on the split cam so for that fixtures were designed for both cylindrical and internal grinding is as shown in Figure below.

1.4 APPLICATION OF FIXTURE FOR CYLINDRICAL GRINDING



1.5 APPLICATION OF FIXTURE FOR INTERNAL GRINDING



For both cylindrical and internal grinding fixtures the material used for its manufacturing is Low Carbon Steel. The heat treatment processes like carburising, annealing and hardening is also done in during the manufacturing process. The fasteners like screws, bolts, hexagonal nut etc, which are used in both fixtures, they are not manufactured. Further standard components of parts are used.

1.6 RESULT AND DISCUSSION

The above components have been modelling and developed by using CATIA software. By using Archard equation wear rate of both existing and modified cam is calculated [8]:

$$Q = \frac{KWL}{H}$$

Where, Q = Total volume of wear debris,
K = Dimensionless constant,
W = Total normal load,
L = Sliding distance,
H = Hardness of the contacting surfaces.

For Existing Method,

K = 5.02×10^{-3}
W = 10 N
L = 682.913×10^{-3} m
H = 420 hv

By substituting above values in Archard equation:

$$Q = \frac{5.02 \times 10^{-3} \times 10 \times 682.913 \times 10^{-3}}{420}$$

$$= 8.162 \times 10^{-5} \text{ m}^3/\text{hr}$$

For Modified Method,

K = 5.02×10^{-3}
W = 10 N
L = 682.913×10^{-3} m
H = 490 hv [as per literature survey]

By substituting above values in Archard equation:

$$Q = \frac{5.02 \times 10^{-3} \times 10 \times 682.913 \times 10^{-3}}{490}$$

$$\text{Wear rate, } Q = 6.996 \times 10^{-5} \text{ m}^3/\text{hr}$$

From the modified split cam wear rate is reduced by 14.3%

From the above calculation one can establish that, the cam that manufactured with modified process will have less wear rate when compared to existing manufacturing process. The values of Vickers hardness are taken from literature survey see reference [12].The proper material is selected for each part of the fixture. Each part is assembled as per the drawings. The Final Split cam and fixture are submitted and discussed. Merits of Modified process, using this Split cam and Fixtures The outcome results were indicated below:

- Overcome of existing wear rate of split cam by modification is decreased.
- Quality of product and their cost also increases during modification.
- High life cycle when compared to old process.
- Surface finishing is also improved.

1.7 CONCLUSION

The "SPLIT CAM" is a part of printing machine. The old model weariness found on the outer surface of the cam. This type of more wear is rectified. The new modified heat treatment process it is decrease the wear property. Normally, this modified process both the manufacturing and labour cost is high when compared to old process. But the new process is better for the production of the split cam because of its better quality and high life cycle. Also it will be very economical for the more productions.

1.8 REFERENCES

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