Forging Defects Analysis in Suspension Arm and Controlling Flash

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Abstract— Forging process commonly used in industry and affected by the process defects like folds or laps, unfelling, cracks size variations prevalent in forging process. The Suspension arm are made by different material. The significant parameters such as stock size, cut length, cut weight, billet temperature. Forging defects of suspension Arm under different manufacturing condition successfully analysed by different total length of job and weight of job, rolled cross section job temperature of job.

Key words: Suspension Arm, Billet Length, Forging Process Defects

I. INTRODUCTION

The process of forging is concerned with the shaping of metal by application of compressive force. The process is normally performed "cold","warm","hot" forging. This process is normally performed hot by preheating the stock to required temperature use of induction heater by radiation pyrometer use to measure technique. The main advantage of hot forging is that as metal is deformed work hardening effects are negated by the recrystallization process, forged part are stronger and tougher than cast or machined part made from the same material due to the reason that the hammering process arranges the micro-structure of metal which met by met scope microscope. The figure 1.2 shows the various processes at the different location point such as the die opne and close die, plastic deformation in flattener, blocker , finsher.

II. METHODOLOGY

This research begins with the input parameters billet length reduces and matianan the weight of final products and controlling wastage of material to flash, process defects such as unfilled, lapes, scale pits cracks mismatch .To forging defects of suspension arm studied, parts under study in a lots size of 450 parts in each lots, then parts are inspected for forging defects as per standard operating procedure.

A. Forging process set up

The forging set up consists of the various operation such as cutting of the billet to proper weight as providing standard, heating of billet in an controlled to forging temperature, pre-form in blocker and placing the per-form in finisher die to forge the component of the desired shape.

III. EXPERIMENTAL SET UP

A. Introduction

This chapter presents the detailed description of the raw materials billet length is the important parameter are used in research paper work with the suspension arm product .To record the inspected for forging defects as per standard procedure, as set for trail is recorded for statistical analysis. To change in billet cutting length to increasing productivity of product and reduce wastage of raw material. To increasing production for increasing die life.

B. Research Outline

The steps followed in experimentation analyses. are shown in. The billet is heated in the induction furnace different section diameter and hot billet is to give final shape by using step by step process. For change by length by length changing billet size process parameter. by various stage in rolling, flattener, blocker, finisher.

Yield ratio are increasing for controlling the wastage of material in form of flash. To reducing the weight of flash and maintaining the weight of job and the weight of cut length billet reducingIn this experimental set up most of defects are occur in surface defects are major problem in controlling for this billet length for increasing yield ratio. Which are form I Surface defects- 1) Burr lap 2) Scale Pit 3) Under Fill 4) Dent Mark 5) Punch Mark 6) Under Cut II Inspection defects- 1) Mismatch 2) Size Variation 3) Bend 4) Under Cut 5)Crack

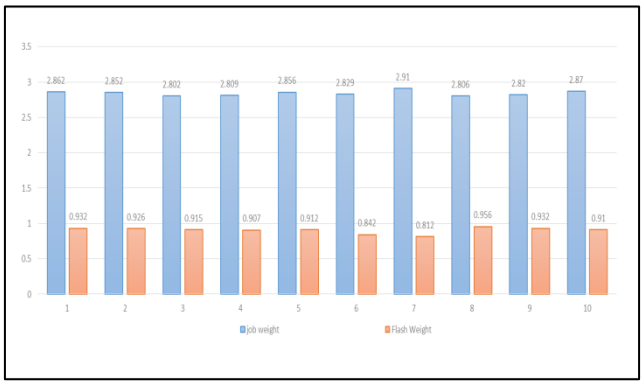
C. Experimental Setup

The schematic diagram of experimental setup is shown in figure 1.2.The billet form the raw material rod cut to final size and weight by the band saw. Material identification selection by colour coding (41CR4) Brown Base and Blue line having required length and weight. The billet is heated in the induction coil having 60ϕ section up forging temperature (1200-1260^{o}c).The hot billet is then rolled by national reducing roll by get total length and cross section (266±mm). The rolled billet is placed on the blocker die to remove the scaling by using diecoolent. forging of the desired shape and size and flash extension is cut by trimming and cooling by air cooling. The hot forging is cooled and heat treated to relieve the stresses induced during forging by using furnaces for annealing & normalizing. The forged components are coning don by control bend, the cleaned by the shot blast cleaning machine by using the metal ball blast and the air blast. To check the quality of the forging parts the parts are inspected hundred percent visually by green inspection for the forging defects and ten. Percent with the help of vernier caliper and height gauge dimensional accuracy. After dimensional and visual inspection crack check by MPI magnetic particle inspections by standard by ASTM.

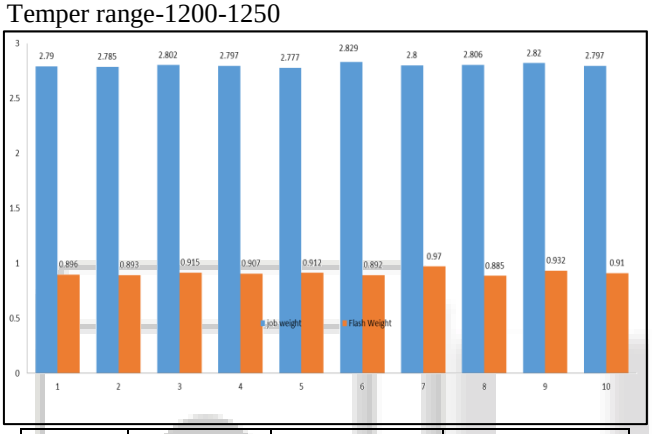
Sr No.	job weight	Flash Weight	Temper Range
1	2.862	0.932	1210
2	2.852	0.926	1220
3	2.802	0.915	1235
4	2.809	0.907	1228
5	2.856	0.912	1225
6	2.829	0.842	1230
7	2.91	0.812	1235
8	2.806	0.956	1220
9	2.82	0.932	1210
10	2.87	0.91	1222

Table 1: Show 167mm length job details

D. Analysis of Defects Suspension Arm Shaft

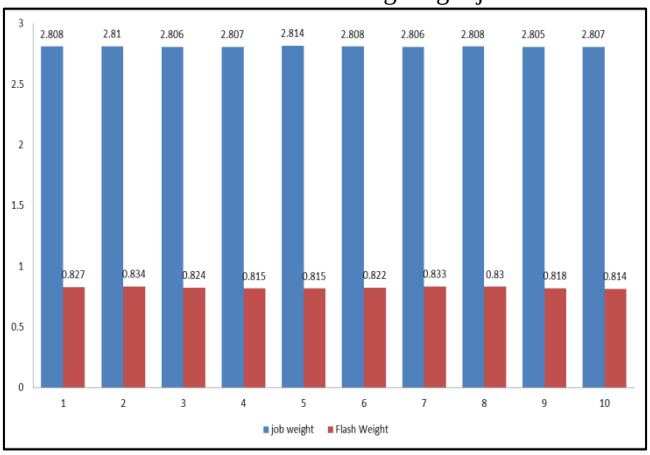


Die- 119 Part Name- Suspension Arm Cut Section 60 165mm length.
Cut Weight- 3.540kg
Temper range-1200-1250



	job weight	Flash Weight	Temper Range
1	2.808	0.827	1240
2	2.81	0.834	1235
3	2.806	0.824	1250
4	2.807	0.815	1260
5	2.814	0.815	1255
6	2.808	0.822	1245
7	2.806	0.833	1235
8	2.808	0.83	1220
9	2.805	0.818	1236
10	2.807	0.814	1242
Averag	2.8079	0.8232	1241.8

Table 2: Show 165mm cutting length job detail



E. Analysis of Yield Ratio of Suspensions Arm Shaft

Table 3.6.1 Experimental design with output and yield ratio for suspension arm shaft.

	Cut length---- 165mm Cut weight------3.54kg			
Sr. No.	Cut weight	Net weight	Yield ratio	%(yield ratio)
1	3.540	2.79	0.7971	79.71%
2	3.540	2.785	0.7867	78.67%
3	3.540	2.802	0.7915	79.15%
4	3.540	2.797	0.7971	79.71%
5	3.540	2.777	0.7844	78.44%
6	3.540	2.829	0.7991	79.91%
7	3.540	2.8	0.7910	79.10%
8	3.540	2.806	0.7926	79.26%
9	3.540	2.82	0.7966	79.66%
10	3.540	2.797	0.7901	79.01%

Table 1: cut weight, net weight, net weight, yield ratio relation show utilisation of cut material.

	Cut length---- 163mm Cut weight------3.245kg			
Sr. No.	Cut weight	Net weight	Yield ratio	%(yield ratio)
1	3.245	2.808	0.8653	86.53%
2	3.245	2.81	0.8659	86.59%
3	3.245	2.806	0.8647	86.47%
4	3.245	2.807	0.8550	86.50%
5	3.245	2.814	0.8671	86.71%
6	3.245	2.808	0.8653	86.53%
7	3.245	2.806	0.8647	86.47%
8	3.245	2.808	0.8653	86.53%

Table 2: cut weight, net weight, net weight, yield ratio relation show show utilisation of cut material

Above table 1, 2, 3, we are reducing the cut weight and cut length step by step of suspension arm, in observe that for reducing cutting length and weight of job which are increasing utilisation of material up to 86% to 87%.For reducing the waste of material in form of flash weight are reducing. Cut length and cut weight reducing 167mm to 163mm and weight 3.774 to 3.245 kg. Fig. show the utilisation of material.

	Cut length---- 167mm Cut weight------3.74kg			
Sr. No.	Cut weight	Net weight	Yield ratio	%(yield ratio)
1	3.74	2.862	0.7647	76.41%
2	3.74	2.852	0.7656	76.56%
3	3.74	2.802	0.7491	74.91%
4	3.74	2.809	0.7510	75.10%
5	3.74	2.856	0.7636	76.36%
6	3.74	2.829	0.7564	75.64%
7	3.74	2.91	0.7780	77.80%
8	3.74	2.806	0.7502	75.02%
9	3.74	2.82	0.7540	75.40%
10	3.74	2.87	0.7473	76.73%

Table 3: cut weight, net weight, net weight, yield ratio relation show utilisation of cut material

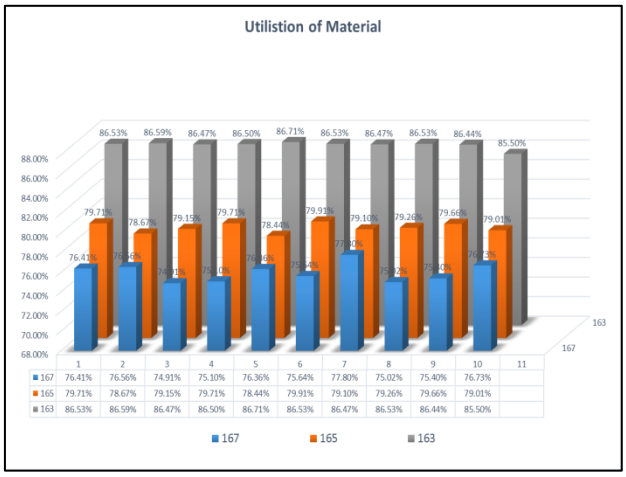
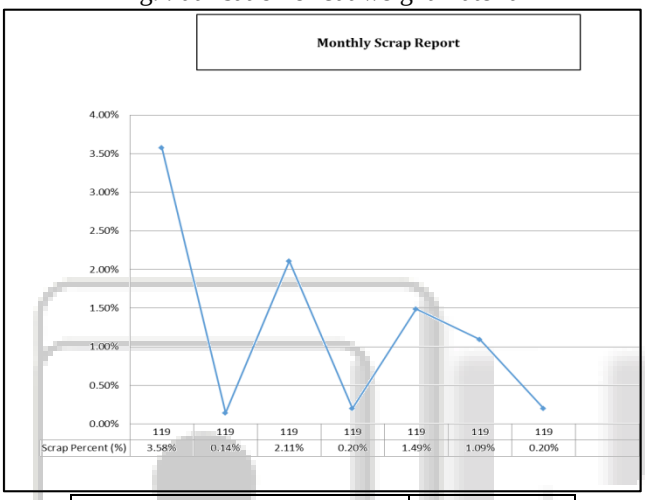


Fig. : utilisation of cut weight material



Cut weight Job weight	Flash weight
Flash weight(167mm) 3.74	0..931
Flash weight(165mm) 3.54	0.8954
Flash weight (163mm) 3.254	0.8232

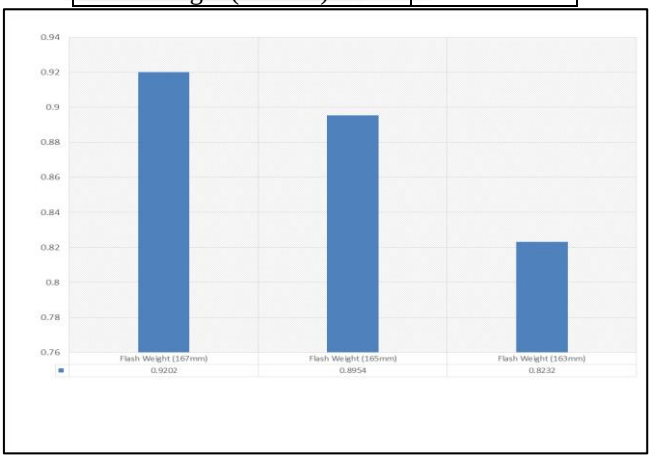


Fig. show Flash weight Reduction ratio.

IV. RESULT

Above table 1, 2, 3, we are reducing the cut weight and cut length step by step of suspension arm, in observe that for reducing cutting length and weight of job which are increasing utilisation of material up to 86% to 87%.For reducing the waste of material in form of flash weight are reducing. Cut length and cut weight reducing 167mm to 163mm and weight 3.774 to 3.245 kg. Fig. show the In way by experimental set up total production of reduction are reduces up 2%, reduction rate get maximum reduction du job location by operated ,which for underfill .

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