Journal of Applied Science and Advanced Technology
Journal Homepage : https://jurnal.umj.ac.id/index.php/JASAT

Analysis Systems of Aftercooler on Bulldozer D375A-6R

Hasan Basri[1*], Jaref Darmawan[1], Ery Diniardi[2], A I Ramadhan[2], Firmansyah[2]
[1]Department of Automotive and Heavy Equipment, Faculty of Engineering, Universitas Muhammadiyah Jakarta, Indonesia
[2]Department of Mechanical Engineering, Faculty of Engineering, Universitas Muhammadiyah Jakarta, Indonesia

ARTICLE INFO

JASAT use only:
Received date : 16 January 2020
Revised date : 17 February 2020
Accepted date : 14 March 2020

Keywords:
Bulldozer
Aftercooler
Pressure
Troubleshooting

ABSTRACT

The bulldozzer is seen as the most efficient heavy equipment unit for mining, specifically dozzing and ripping material. The purpose of this study was to analyze damage due to cracks in the cooler afterwards which caused dust and dirt to enter the air intake system which caused excessive piston, piston ring and cylinder wear liners in the Bulldozer. The research method was conducted using 8-step troubleshooting analysis. The results and discussion are damage due to cracks in the after cooler which causes dust and dirt into the air intake system which causes the piston, piston ring and cylinder liner to wear out excessively. The piston, piston ring and cylinder liner have excessive scratching and wear, so the compression pressure that should be compressed inside the combustion chamber experiences a leak where the air enters the crankcase chamber.

INTRODUCTION

The bulldozzer is seen as the most efficient heavy equipment unit for mining, specifically dozzing and ripping material. The bulldozer is used in almost all sand, coal and gold mining projects [1-2]. The process of pushing the material (sand and rock) in large volumes is done with a short working time and is more efficient by the bulldozer than other heavy equipment units, so do not be surprised if the bulldozer mining site works almost without stopping for the achievement of the production process charged by the company as well as market demand. One of the bulldozers that are often used in mining is D375A-6R. In the D375A-6R unit, often encountered repeated problems namely blow by pressure high, which on average the trouble occurs because the engine combusts dust or dirt in the engine [3-5].

Fig. 1. Bulldozer unit of D375A-6R [1]

Blow-by is an event of rising pressure in the crankcase space which is still permitted, the occurrence of blow by because it is caused by the movement of the piston and accompanied by leakage when the compression step is carried out in the combustion chamber. Blow by has a standard value between 3.4-3.5 kPa. The impact of blow by pressure if above the standard can occur Engine low power due to reduced effort resulting from combustion, wasteful fuel consumption, can cause potential damage to the engine crankcase [6-10].

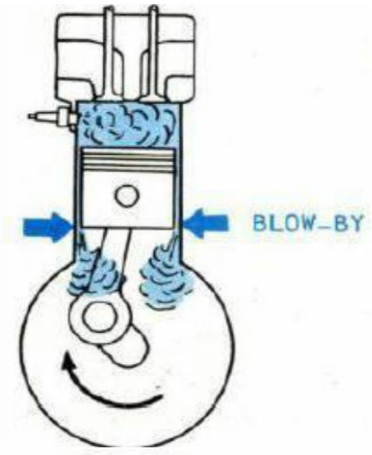

Fig. 2. Blow by [5]

Every engine in the unit must have a standard blow by pressure. Because this pressure comes from

* Corresponding author.
E-mail address: hasan.basri@ftumj.ac.id
DOI: https://dx.doi.org/10.24853/JASAT.2.3.73-76

engine compression leakage in the combustion chamber when the piston moves from TDC to TMB during compression, then the pressure will leak through the gap between the piston ring and the liner wall, so the blow by pressure will increasingly increase. The causes of blow by high include damage to the piston ring 17, wear and tear on the liner, deadlock on the air cleaner, breathiness on the valve, valve (stem, guide, and seal), and turbocharger leaking turbine side [11-15].

The purpose of this study was to analyze damage due to cracks in the cooler afterwards which caused dust and dirt to enter the air intake system which caused excessive piston, piston ring and cylinder wear liners in the Bulldozer.

EXPERIMENTAL METHOD

Analysis of 8 step for Troubleshooting

On troubleshooting analysis using flowcharts as in Figure 3.

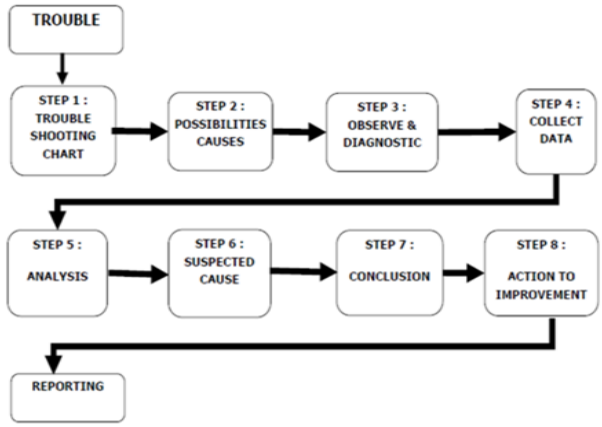

Fig. 3. Troubleshooting flowchart for analysis

RESULTS AND DISCUSSION

From the results of visual checking also testing compression and blow by which have been carried out during the observation and diagnostic stages. The following results are obtained:

Table 1. Visual analysis

Check item	Standart	Actual	Information
Pre cleaner	No damage	No damage	OK
air deaner	No clogged & no damage	No clogged & no damage	OK
Breather & hose breather	No clogged & no damage	No clogged & no damage	OK
aftercooler	No damage	Crack found	Not OK
Turbocharger	No damage & leakage	No damage & leakage	OK
Dust indicator	Do not point to red	Do not point to red	OK
Kompresi cyl.1	2,94 Mpa	2,4 Mpa	Not OK
Kompresi cyl.2	2,94 Mpa	2,6 Mpa	Not OK
Kompresi cyl.3	2,94 Mpa	2,4 Mpa	Not OK
Kompresi cyl.4	2,94 Mpa	2,4 Mpa	Not OK
Kompresi cyl.5	2,94 Mpa	2 Mpa	Not OK
Kompresi cyl.6	2,94 Mpa	0,8 Mpa	Not OK
Blow by pressure	3,43 Mpa	> 5 Kpa	Not OK

In this troubleshooting the main cause of blow by high pressure is the occurrence of wear on the piston ring (1) and cylinder liner (2) which results in compression on each cylinder to be low compression which should have a standard compression of 2.94 kPa. The most severe low compression occurs in cylinders no. 5 and 6 have been seen when doing compression testing using a compression tester when in the field, the cause of rising blow by pressure and the occurrence of low compression is because the air during the compression process carried out by the piston was leaked into the crankcase room. What causes wear and tear on the piston ring and cylinder liner is the occurrence of cracks which cause leakage in the after cooler (3) which causes dust and dirt to enter the air intake system circulation. The entry of dust and other impurities is caused by air pressure and the rate in the after cooler (3) is high so that the dust gets sucked into the after cooler.

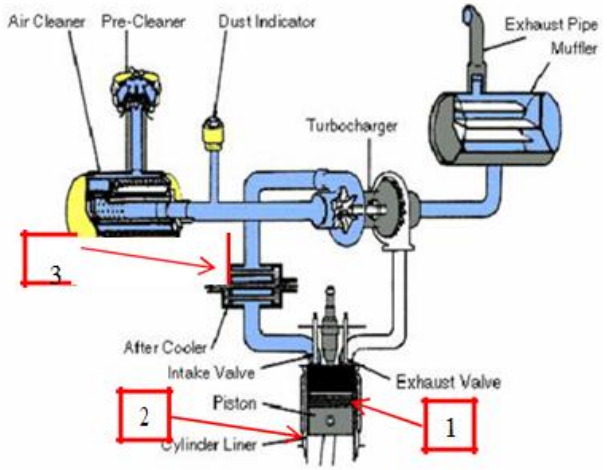

Fig. 4. Air intake system

Allegedly the oil that gushes out through the engine oil fill hole due to increased blow by pressure due to cracks in the after cooler which causes dust and dirt into the air intake system and causes the piston, piston ring and cylinder liner to wear excessively so from the results of previous analyzes need to do repairs on the cracked after cooler housing so that there is no dust coming back into the air intake system circulation due to a leak in the after cooler.

Journal of Applied Science and Advanced Technology 2 (3) pp 73-76 © 2020

Fig. 5. After cooler crack

From the results of checking above, it can be concluded that the occurrence of Blow by high on the D375A-6R is caused by, broken piston rings, worn pistons and scratch liner cylinders, broken piston rings, worn pistons and scratch liner cylinders caused by leakage in the after cooler which creates dust and dirt enters the combustion chamber thereby indicating excessive friction between the piston ring, piston and cylinder liner. So in this troubleshooting that must be done is to overhaul and replace and repair parts.

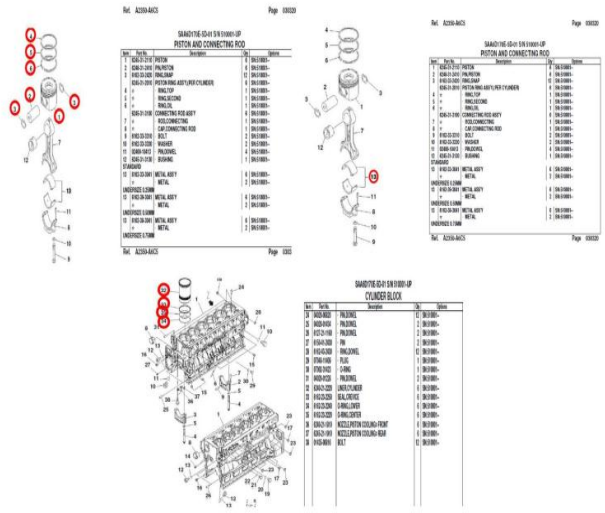

Fig. 6. Part Replace (Standard part overhaul)

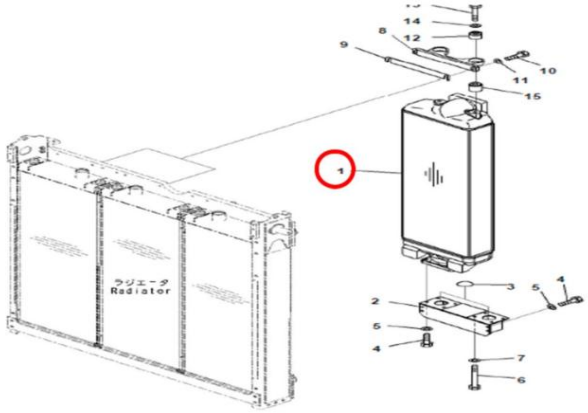

Fig. 7. Part repair (after cooler)

CONCLUSION

Based on the results of analysis, checking and data collection, the writer can get the conclusion of damage due to cracks in the after cooler which causes dust and dirt into the air intake system which causes the piston, piston ring and cylinder liner to wear out excessively. The piston, piston ring and cylinder liner have excessive scratching and wear, so the compression pressure that should be compressed inside the combustion chamber experiences a leak where the air enters the crankcase chamber. Pressure blow by rise is caused by a leak in the combustion chamber during the compression process due to wear and tear on the piston and piston rings.

REFERENCES

[1] Shop Manual Komatsu D375A-6R SEN05214-01 Serial Number 65001 and up. All Rights Reserved Printed in Japan D375-6R BULLDOZER Form Number. SEN05214-01 2010 KOMATSU All Rights Reserved Printed in Japan

[2] OMM (Operation & Maintenance Manual) Komatsu D375A-6R Serial Number 65001 and up. Form No. TEN00388-00 2010 KOMATSU All Rights Reserved Printed in Japan 01-10.

[3] Shop Manual engine SAA6D170E-5 HPCR EGR SEN00190-04. Shop manual Komatsu D375A-6R Serial Number 65001and up Copyright 2006 KOMATSU printed in U.S.A Komatsu America corp.

[4] Part Book SAA6D170E-5D-01 S/N 510001-UP

[5] Basri, H., & Ramadhan, A. I. (2018). Measurement of Hydraulic Pressure Fan Motor in Engine D1551A-6 with Modification Tool Adapter. *International Journal of Scientific & Technology Research*, *7*(8), 249-251.

[6] Chan, E. I. (2013). Studi Deskriptif Pengelolaan dan Pengembangan Sumber Daya Manusia pada Usaha Penyewaan Alat Berat PT. Indo Crane Pratama di Balikpapan. *Agora*, *1*(3), 991-1005.

[7] Diniardi, E., Ramadhan, A. I., & Basri, H. (2014). Analisis Kekuatan Mekanik Dan Struktur Mikro Pada Material Polimer Penyusun Kipas Radiator. *Jurnal Teknologi*, *6*(1), 55-67.

[8] Basri, H., Diniardi, E., & Ramadhan, A. I. (2019). Troubleshooting Blow by Pressure High on the Komatsu Bulldozer Unit D375A-6R. *Journal of Applied Sciences and Advanced Technology*, *2*(1), 17-20.

[9] Basri, H., Diniardi, E., & Ramadhan, A. I. (2015). Studi Analitik Desain Dimensi Silinder Boom pada Hydraulic Excavator Pc 1250-7. *Prosiding Semnastek*.

[10] Ilyuchyk, P. A., & Basalai, R. A. (2019, November). Modernizing the variable transmission as a way of improving the efficiency of dump trucks operation. In *Topical Issues of Rational Use of Natural Resources 2019, Volume 1: Proceedings of the XV International Forum-Contest of Students and Young Researchers under the auspices of UNESCO (St. Petersburg Mining University, Russia, 13-17 May 2019)* (p. 378). CRC Press.

[11] Basri, H., Rasma, R., Ramadhan, A. I., & Diniardi, E. (2017). Analisa Kerusakan Alternator Semi Konduktor Regulator Pada Charging System Pada Unit Dump Truck 465-5. *Prosiding Semnastek*.

[12] Purba, H. H. (2016). Reducing the operational stop time of Hauller Komatsu Hd465-7 by using the Six Sigma's approach in Pt X. *ComTech: Computer, Mathematics and Engineering Applications*, *7*(2).

[13] Diniardi, E., Ramadhan, A. I., Mubarok, R., & Basri, H. (2015). Analysis of mechanical properties connecting rod bolts outboard motor FT50CEHD. *International Journal of Applied Science and Engineering Research*, *4*(5), 665-670.

[14] Li, X. H., Cao, J. W., Liu, S. M., & Wang, C. (2012). Study on Modal Analysis and Dynamic Performance of Electric Wheel Self-dumping Truck Carriage. In *Applied Mechanics and Materials* (Vol. 127, pp. 395-399). Trans Tech Publications Ltd.

[15] Yakub, A., Karmiadji, D. W., & Ramadhan, A. I. (2016). Optimasi Desain Rangka Sepeda Berbahan Baku Komposit Berbasis Metode Anova. *Jurnal Teknologi*, *8*(1), 17-22.