

VIBRATION ANALYSIS OF GEARMESH IN EVERY CONDITION USING THE VIBRATION SIGNAL

FINAL PROJECT

To fulfill partial of requirement
to achieve undergraduate level in mechanical engineering.



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ENGINEERING FACULTY
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NOVEMBER 2014**

DECLARATION OF RESEARCH AUTHENTICITY

I assert verily that the research entitles:

VIBRATION ANALYSIS OF GEARMESH IN EVERY CONDITION USING THE VIBRATION SIGNAL

That made to fulfill some of requirement to get Bachelor Degree of Engineering in Automotive Department of Muhammadiyah University Surakarta, as far as I know it is not a plagiarism of research that has been published, except the information source which used to solve the problem.

Surakarta, November 2014

Researcher,

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APPROVAL

The Final Project entitles "Vibration Analysis of Gearmesh in Every Condition Using the Vibration Signal" has been approved by Supervisors and authorized by Secretary of International Program as partial fulfillment of the requirements for getting the Bachelor Degree of Engineering in Automotive Department of Muhammadiyah University Surakarta.

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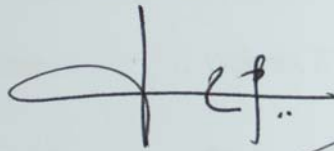
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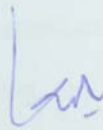
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ABSTRACT

The purpose of the research is to detect the defect of the gear on the gearbox using vibration signal analysis. The experiment was done on four condition of gear. Gears are in good condition, a half broken tooth, one broken tooth, and cracked. The gear rotational speeds were taken in 300 rpm, 750 rpm, and 2250 rpm. Vibration data acquisition was done using vibrationmeter and PC. Vibrationmeter record the signal on time domain and convert it to frequency domain. Defect analysis was done in the time domain and frequency domain.

Experiment result showed that time domain, defect of gear could detected by spike appearing every one period of shaft revolution. This case was indication of gear having broken one broken tooth. Then, on two broken teeth, amplitude of spike period was smaller than one broken tooth condition. Whereas on a half broken tooth condition failure was difficult to detect at time domain. At frequency domain, indication of a half broken tooth was seen by increasing amplitude of gearmesh frequency four time to 39,57 volt and sideband appearing. Then on one broken tooth indication could be seen by increasing amplitude of gearmesh frequency ten times to 123,5 volt and sideband appearing. On cracked gear, indication could be seen by increasing amplitude of gearmesh frequency four times to 123,5 volt and appearing many sidebands. Every sideband have a

distance a shaft revolution frequency. Sideband appearing and increasing amplitude of gearmesh can be detected as failure of gearbox.

Key Word: Predictive Maintenance, Sideband, Gearmesh, Gearbox

MOTTO

Imaging my word, I read the meaning, I tied in paragraph, I frame in chapter a number of five, and it become a masterpiece, I received a bachelor's degree, parents, fiancée and future in-laws were happy.

I came, guidance, examination, revision, and I won.

We pray when troubles and in need of something, we should also pray in great excitement and abundant sustenance. (Khalil Gibran)

The lack of confidence that make people afraid to face the challenges, and I believe in myself. (Muhammad Ali)

Work like do not need money. Love like never hurt. Dance like no one watching. (Mark Twain)

They say that everyone needs three things that will make them happy in this world, namely; someone to love, something to do, and something to hope. (Tom Bodett)

Real friend is one who grabbed your hand and touches your heart.
(Heather Pryor)

I am thankful to all those who said NO to me, It is because of them I did it myself. (Albert Einstein)

It is very easy to defeat someone, but it is very hard to win someone. (Dr. Abdul Kalam)

DEDICATION

This Research Paper is dedicated to

Allah SWT,

Thanks for the best everything You have given for me and thanks for your love that make me never give up to do the best. I believe that you will always give me the best for everything.

My Belover Mom and Dad,

(Ir. Ichsan and Sri Murwani, S.Ag),

Thanks for your pray, love, support, and affection. You always give me happiness but I often made you disappointed. I am sorry and I promise to give you the best in the future.

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Thanks for giving me love, support, spirit, attention, care and advice every day. Along these time, you have made me better, be adult and become wiser.

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The writer realize that this research is far from being perfect, so the writer sincerely welcome any constructive comment, critics, and suggestion from anyone.

Wassalamu'alaikum Warohmatullahi Wabarokatuh

Surakarta, November 2014
Writer

Fani Nur Fadhila Ichsan

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LIST OF SYMBOLS

f_n = Natural frequency (hertz)

k = Stiffness of the spring (N/m)

m = Mass (kg)

Δy = Deflection (m)

F = Force (N)

E = Young modulus (N/m²)

I = Inertia moment (Kg m²)

L = Length (m)

b = Broad (m)

h = High (m)

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