# CERTIFICATION OF APPROVAL

**Risk-Based Inspection – Flyash Erosion on Boiler Tube at Coal-Fired Power Plant**

by

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A project dissertation submitted to the

Mechanical Engineering Programme

Universiti Teknologi PETRONAS

in partial fulfilment of the requirements for the

BACHELOR OF ENGINEERING (Hons)

(MECHANICAL ENGINEERING)

Approved by,

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TRONOH, PERAK

June 2010

CERTIFICATION OF ORIGINALITY

This is to certifty that I am responsible for the work submitted in this project, that the original work is my own except as specified in the references and acknowledgements, and the original work contained herein have not been undertaken or done by unspecified sources or persons.

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# ABSTRACT

Risk-Based Inspection (RBI) is a method that defines the risk of operating equipment as the combination of two separate terms; the likelihood of failure and the consequence of failure. Usually, one of the major factors of boiler tripping at power plant is the presence of in-service defect tubes due to flyash erosion that lead to tube thinning. Conducting an inspection program could help to identify the concerned defect tubes by shutting down the equipment. Frequent inspections or shutdown would be costly and could affect the production of the plant. Through Risk-Based Inspection assessment, the concerned defect area could be prioritized for an optimum inspection program. However, current API 581 Risk-Based Inspection Base Resource Document does not cover specified guideline to evaluate on erosion consequence with steam as representative fluid.

This study intends to propose a more relevant approach to quantify consequence of failure when steam, a nonflammable and nontoxic fluid is evaluated with flyash erosion as damage mechanism. The paper also explains the difficulties of applying API 581 RBI Consequence Analysis and explained on the comparison results between API 581 RBI Consequence Analysis approach with the proposed approach. The assessment would involve Semi-Quantitative Analysis comprising of Technical Module Sub-factor (TMSF) for likelihood of failure and Business Interruption Cost for consequence of failure using real plant data.

The criticality results of the Flyash Erosion Module using the proposed approach showed a shift from low to a medium risk level in contrast to the analysis based on API 581 Risk-Based Inspection (RBI) Base Resource Document. If the analysis is based on the affected area as outlined in API 581 RBI Base Resource Document, Business Interruption Cost will be $0.00, therefore the risk is zero. Thus, it can be surmised that API 581 Risk-Based Inspection Consequence (RBI) Approach could not be applied if the concerned representative fluid is inflammable-type and will only reflect an erroneous Business Interruption Cost. The developed Flyash Erosion Module will yield with a reasonable result in quantifying the risk.

# ACKNOWLEDGEMENT

***In the name of Allah the Most Merciful God***

Praise to Allah and thank to Him, this dissertation was finally completed and finished my Final Year Project. Highest appreciation goes to Ir. Dr. Mokhtar Che Ismail, my supervisor, for his relentless patience and guidance throughout the project.

Also a special express gratitude for Mechanical Engineering Department of Universiti Teknologi PETRONAS for providing excellent support in terms of providing cutting edge knowledge and information along five years spent undergoing every single bit of valuable knowledge on mechanical engineering.

Many thanks go to Ms. Ainul Mokhtar, lecturer from Mechanical Engineering Department for her supportive efforts on assisting me with the technical support and guidance towards this project.

Last but not least, thanks to everyone who had been involved directly or indirectly in making and delivering this project succeed.

MOHAMAD HASRUL HILMI B KHAIRUL AMAN