ANALYSIS OF THE CLOTHING EFFECT FROM BLEVE FIREBALL IMPACT AT DYNAMIC PARAMETER CONDITION

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This report is submitted in partial fulfilment of the requirements needed for the reward of Degree in Chemical Engineering

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JULY 2019

ACKNOWLEDGEMENT

Prima facea, I am very thankful to Allah for the strength and bless to me to complete this report and also the knowledge that I have learnt and gained for the past years through this research and thesis. Next, I would like to give my sincere thanks to my supervisor Dr Zulkifli bin Abd Rashid, for always give me guidance and encouragement.

I take this opportunity to say thank you to the Head of Department and Coordinator of Faculty of Chemical Engineering UiTM Bukit Besi for providing facilities to do this research. Not to mention UiTM itself who give me chance to study in this very incredible institution to improve and upgrade myself throughout all of this years in my diploma and also to other staff, and friends.

I am extremely thankful for all the support, help and encouragement that is given to me either directly or indirectly from time to time. Not to be forgotten, a million of thanks I dedicated to my parents for their support through my entire time pursuing this degree. Once again thank you to all and may Allah the most merciful and compassionate to bless all of you for eternity.

ABSTRACT

This research is conducted to study the effect of BLEVE fireball impact to the human in the area. The research focus on the effect and severity from blast and radiation based on the fabrics they wear. The data used in this is based on the previous case study of tohoku LPG explosion.

The experiment starts with determining the relevant theory and equation needed. The parameter of the fireball from the BLEVE is then determined using the formulae for the duration, diameter height and the thermal radiation emitted from the BLEVE fireball. Then, using the quantitative value determined, the effect to the different type of fabrics is simulated using excel worksheet. Among the type of fabrics considered are wool, polyester, acrylic, nylon, etc. It is concluded that the wool is the most resistance material due to its high resistance to heat radiation. Mixture of 65% polyester and 30% cotton, 100% acrylic and 100% nylon are less effective for heat radiation resistance.

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CHAPTER ONE
INTRODUCTION

1.1 Research Background

BLEVE stand for Boiling Liquid Expanding Vapour Explosion. A BLEVE occurs when a vessel or tank containing liquid at the temperature above its boiling point failed and explode (Pinhasi et al., 2007). The explosion is due to the build up pressure inside the tank from the rapidly boiling liquid. BLEVE is among the most feared incident in industry that can cause a catastrophic accident. For example, on November 19, 1984 a major fire in Liquefied Petroleum Gas (LPG) storage in Mexico City caused a major explosion from the tank failure with an estimated of 600 death and 7000 injured (Arturson, G. 1987). Depending on the pressure of the gas inside the vessel, the effect of the explosion varies.

The terms BLEVE is believed originate in 1957 when used by three engineers at Factory Mutual Research Corp., USA Smith, Marsh and Walls (Abbasi T. and Abbasi S. A., 2007). It is reported that the engineers first used the term when they witnessed an explosion that cannot be categorized by any explosion type known then. It was the explosion of a cast iron vessel used to produce phenolic resin by the chemical reaction between formalin. The content of the vessel is not flammable, but the resulting explosion is reported to be worst. From their research, they determined that the cause of the explosion is high boiling liquid pressure inside the vessel the vessel failure.

Because the explosion varies according to the pressure and content inside the vessel and the vessel condition, BLEVE accident can be avoided by properly studying its caused and effect and work to prevent it. The blast and fragmentation consequences of a BLEVE event depend directly on the internal energy of the vessel's contents, which is a function of the material's thermodynamics property and mass. Cautionary step such as wearing the Personal Protective Equipment, PPE can also help protect the personnel working near a pressurize vessel in the event of BLEVE accident.