COMPARISON OF THE EFFECT OF HOME-MADE EXPLOSIVES SUCH AS ANFO AND NM AGAINST A MILITARY GRADE EXPLOSIVE, PE4, IN OPEN AIR ENVIRONMENT

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ABSTRACT

This study examines the performance disparities among various explosives that were subjected to controlled detonations, shedding light on their suitability for diverse applications. Notably, our research underscores that Plastic Explosive 4 (PE4), a plastic explosive, stands out as the most energetically potent among the tested explosives. It exhibited significantly higher peak reflected pressure and impulse when compared to Nitromethane (NM) and ammonium nitrate, and fuel oil (ANFO), all evaluated at the same net explosive charge (NEC). Conversely, ANFO emerged as the least energetic in our comparative analysis, presenting crucial insights into its performance limitations.

In the realm of homemade explosives, NM demonstrated remarkable superiority to ANFO. NM demonstrated substantially higher peak reflected pressure and impulse when detonated at an equivalent standoff distance. This outcome accentuates the substantial performance variations even among homemade explosives, emphasizing NM's robust explosive effect compared to ANFO.

Additional analysis of waveform data revealed crucial insights into the explosives' detonation dynamics. PE4 and ANFO exhibited the shortest peak rise times, signifying rapid pressure build-up upon detonation. In contrast, NM exhibited a relatively longer peak rise time, indicating a more gradual pressure increase during detonation.

Moreover, our examination of positive phase duration illuminated further distinctions, with PE4 displaying the longest duration, followed by NM and ANFO. This suggests that PE4 sustains elevated pressure levels for a more extended period during the positive phase of the blast, whereas ANFO exhibited the shortest positive phase duration.

These distinct distinctions in peak pressures, impulse, peak rise times, and positive phase durations have profound implications across various applications. The choice of explosive in military, industrial, or mining settings should align with specific objectives. While PE4's higher energy output can be advantageous, it also entails increased risks. Conversely, ANFO's lower energy output may be preferred in controlled explosion scenarios.

In conclusion, this study offers valuable insights into the distinct performance characteristics of PE4, NM, and ANFO explosives during controlled detonations. These findings enrich our understanding of explosive behaviour, guiding informed decisions across an array of applications, spanning military, defence, industrial, and mining contexts.

INTRODUCTION

The detonation of explosive charges is a phenomenon that generates shockwaves with the potential to cause significant harm to individuals. These shockwaves primarily affect gas-containing organs within the human body, such as the lungs, middle ear, and gastrointestinal tract [1]. Understanding the behavior of these shockwaves is critical for developing protective equipment and materials to mitigate the injuries caused by explosive events, particularly in scenarios involving improvised explosive devices (IEDs).