Experimental Investigation into shape destruction with application of OME principles

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Background

Process flow has stagnated creating a storage problem. The issue has drawn attention from senior leadership and regulators but any previous exploration to resolve the issue has not come to any fruition. Given the current economic climate, the costs to run and maintain the facility for redundant legacy components is unnecessary. There is currently no disposal route for these components due to an inability to carry out clearance monitoring.

Aim & Methods

To develop and enable an appropriate method to shape destroy the component to enable clearance monitoring, enable disposal, reduce or remove the requirement for regular monitoring and maintenance. Application of explosives to sufficiently achieve shape destruction

Results

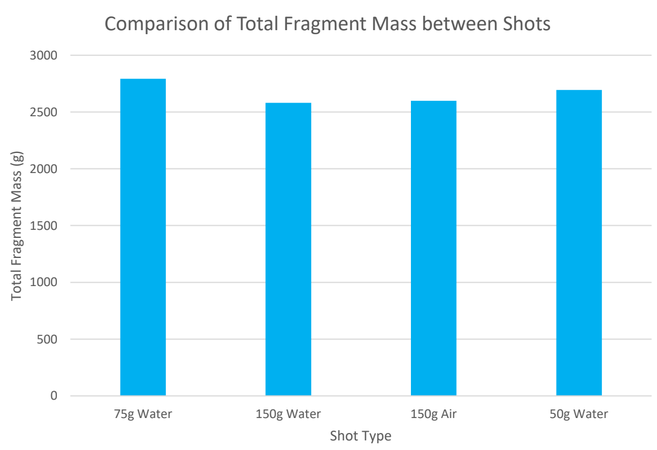

Figure 1: Shows the total mass of fragments from each firing. The mass of fragments is less than the initial mass of the component. This can be attributed to Mott's Theory which states that approximately 10% of the initial mass of an article will be 'lost' in particulate form [2].

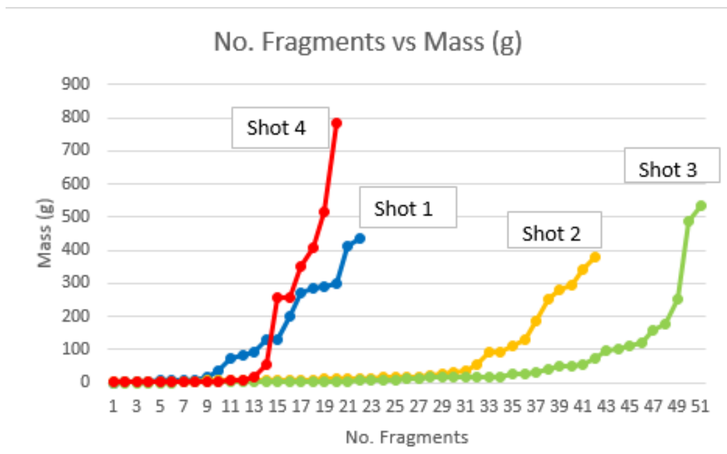

Figure 2: Shows the fragment mass against the number of fragments from each firing. As expected the number of fragments significantly decreases with the lesser quantity of explosive material. The lesser quantity of explosive material also yielded fragments of greater mass. The number of fragments can also be attributed to the brisance derived from the firing being done non-submerged.

Figure 3: The physical results from the first firing using 75g of PE8 with the component and charge submerged in water. It is clearly visible that shape destruction of the component was achieved.

Conclusion

Results from the firings in water compared to firings without water were significantly more amenable. With the component submerged the quantity of explosive material used in the firings could be greatly reduced to achieve the same results, and results suggest that further reduction in the explosive material used could be applied and still meet the customer requirements. The project demonstrated successful shape destruction and enabling of monitoring allowing for disposal progression.

References

[1] J. Thomas, Artist, *Project Storyboard.* [Art}
[2] M. H. M. Abuuznein and M. A. AAbdalla, *"WARHEAD FRAGMENTS MASS DISTRIBUTION USING NUMERICAL COMBINATION OF MOTT'S AND HELD'S FORMULAS,"* in 5th International Conference of Chemical and Environmental Engineering 25-27 May 2010, Cairo, 2010.

Future Works

Further work into the identifying the minimal quantity of explosives required to achieve shape destruction would be beneficial as it would reduce cost and exposure to personnel. Employing a more efficient modelling software or technique would prove beneficial as would be able to indicate behaviours and reduce the need for as many physical trials. Exploration into the use of a pressure vessel to carry out the firings would prove beneficial as would be able to predominantly re-use the firing set-up and would add an extra layer of protection to the chamber.

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