Press Release

LASTFIRE Foam Application Tests, Dallas Fort Worth Airport

As part of their ongoing evaluation of new generation foams, LASTFIRE, the international forum of oil companies developing best practice standards in storage tank fire hazard management, has carried out a further series of tests, working with Dallas Fort Worth Research and Training Centre, to develop greater knowledge on the capability of new generation firefighting foams, including both Fluorine Free and new generation (post USEPA Stewardship) "C6" fluorosurfactant based concentrates.

The tests followed on from previous work carried out by LASTFIRE which showed that such foams could, with appropriate application rates and equipment (as with all foams!) provide adequate protection for some limited size tanks storing some fuels, but, amongst other issues, additional work was required to determine maximum flow lengths for foam travel over unignited and burning fuel surfaces for other situations.

The earlier work included the successful extinguishment of gasoline tank (11m diameter) fires with both Fluorine Free and C6 types of foam concentrate but it is highlighted that generic conclusions regarding performance of different foam types should not be made because extinguishing capability is very much dependent of the foam concentrate and application device combination.

In particular, the earlier work showed that Compressed Air Foam (CAF) generated foam could potentially provide significant advantages in terms of application rate requirements over conventional aspirated foam application and still provide the same levels of risk reduction.

Articles have been published on the LASTFIRE work by the Energy Institute and Industrial Fire Journal as well as detailed reports being prepared by LASTFIRE. Based on the proven effectiveness of CAF based application during these tests there was confidence in the methodology, but it was necessary to carry out larger scale tests to ensure that other aspects such as the distance of flow capability over longer distances as required by large diameter tanks, bunds or spill fires could also be proven.

LASTFIRE therefore moved to another phase of testing to determine if the results could be scaled up to help assess suitability of the foams for larger incidents.

A cooperation was established with Dallas Fort Worth Fire Training and Research Center (DFW FTRC) as they had also carried out test work on Fluorine Free Foams and the issues facing the oil industry are similar to those facing the aviation sector so cooperation and networking is paramount in order to ensure that limited budgets are used as efficiently as possible and that there is mutual knowledge sharing.

The original intention was to carry out a number of tests including both monitor and pourer application using Fluorine Free foams that had performed well in previous tests with both conventional aspirating and CAF based foams. Also, a comparison with a C6 fluorosurfactant based foam was planned.

However, due to problems with the test pan being jeopardised and extremely heavy rain and strong wind conditions (the worst on record for the area!) during the allocated test window, it was not possible to complete the intended programme. The problems with the test set up highlighted the need for a permanent facility to carry out large fire tests.

Fortunately, the tests that were possible gave extremely useful results. The remaining tests will be carried out in 2019 but meanwhile this article summarises the results to date.

Test conditions

The latest work evaluated both conventional aspirated and CAF foam using "semi-gentle" foam pourer application equipment over ignited fuel surface distances of 30m and 40m respectively. The fuel used was Jet A aviation kerosene.

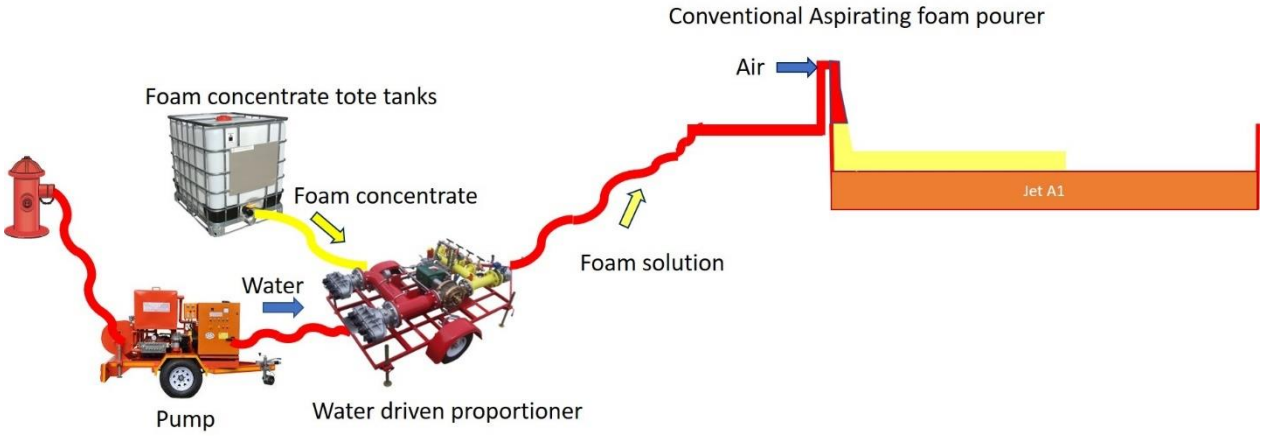

Fig 1. Schematic of Test set up for Conventional Aspirating Pourer Application

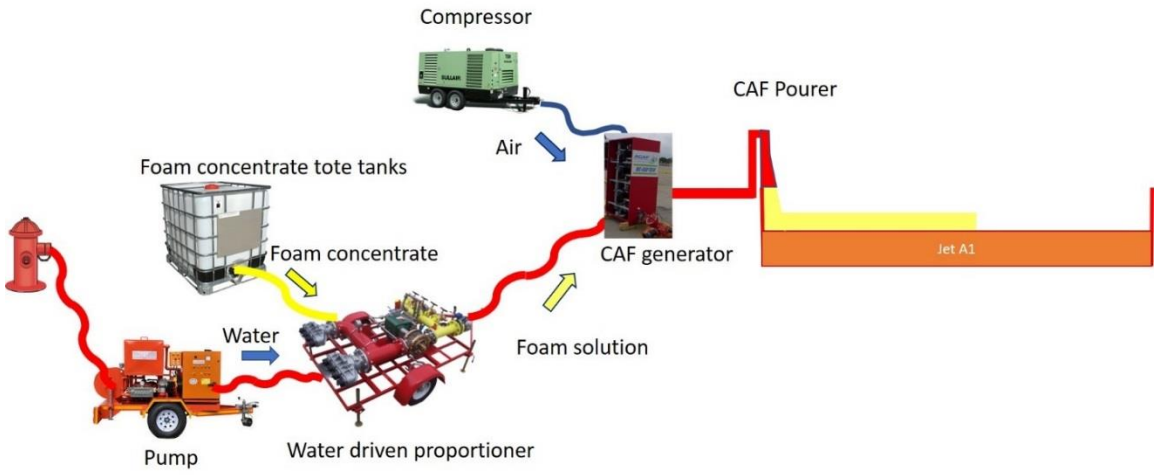

Fig 2. Schematic of Test set up for Compressed Air Foam application

A Fluorine Free Foam specifically designed for industrial incident application at 3% proportioning was used.

Two main tests were carried out. One involved CAF pourer application at 2lpm/m^2 into a 40m long, 8m wide pan, the other conventional pourer application at 4lpm/m^2 (the standard NFPA 11 foam solution application rate) into a 30m long, approximately 3m wide pan.

In both cases the foam travelled rapidly over the fuel surface extinguishing all areas including the edges of the hot metal pan. In the 40m test, when the foam had reached approximately 30-35m, problems began to arise with the integrity of an outer containment structure. Consequently, contingency plans were implemented which included application of additional foam (of the same type) into the area surrounding the actual test pan by handline. Some of this entered the pan itself but did not have any significant effect on the foam flow. In fact it could be argued that the direction of application hindered the flow from the pourer. As the foam under test reached the 40m mark a back up foam pourer (again using the same foam) at that "far" end of the test pan was also actuated but by then all edge flickers had been extinguished.

The conclusion was that the foam had performed exceptionally well. From video footage of the test it was noted that full extinguishment was achieved in 3'27" from time of actuation. The time taken for 30m of the test pan to be extinguished was 2'23". (30m is the maximum distance implied in standards for foam flow to be effective.)

40m test CAF pourer application – extinguishment to ~30m

40m test CAF pourer application "virtual extinguishment". Note back up pourer not yet actuated and remaining fire outside the actual test pan (due to fuel leaking into secondary containment from a fuel line.)

In the second, 30m pan, test, the foam solution flow rate was adjusted to provide an application rate of 4lpm/m^2 in accordance with NFPA 11 application rate for such systems.

Foam travelled rapidly over the fuel surface and gained virtual extinguishment with edge flickers and a small corner only still ignited in 2'32".

Sequence of fire control and extinguishment

1) 40m length fire, CAF application, 2lpm/m^2

Back up pourer operating after extinguishment

2) *30m length fire, Aspirating pourer application, 4lpm/m²*

Comparison of CAF application and Conventional Aspirated Foam Application

The comparison of time to 30m flow length extinguishment is as follows:

- CAF application at 2lpm/m^2 – 2'23"
- Aspirated foam pourer at 4lpm/m^2 – 2'32"

The tests also clearly showed that the foam generated by the CAF pourer can travel at least 40m over a burning fuel and seal against hot tank walls leading to full extinguishment.

Conclusions

It is clear from the results that this particular Fluorine Free foam was very effective in these tests, especially when applied as a CAF based foam.

It is again emphasised that this work has been carried out with one specific Fluorine Free foam on one fuel type with specific application devices but the results are in line with those obtained in the earlier tests comparing performance (with both pourer and monitor application) with that of fluorosurfactant containing foams on gasoline fires.

The next steps

Having validated the standard LASTFIRE test from the previous work, this protocol will now be used to compare performance of this same foam but with crude as the fuel and further tests will be carried out to optimise foam properties. This work is planned to be completed by end of 2018.

The completion of the larger scale test programme is targeted for April/May 2019.

This test work applies to all foam applications. It represents the most comprehensive programme of foam testing driven and managed by end users for more than 35 years.

LASTFIRE also develops best practice guidance for foam usage during this crossroads that all end users are facing – and this of course is led by end users on a non-commercial basis.

Anyone interested in participating in this future test work or any other aspects of LASTFIRE work, from any industry sector, should contact info@lastfire.org.