



Tanker Off-Load Test: 5,000 gallon Tanker with a 500 gpm Pump

Granby Fire Department
Granby, Massachusetts

The Tanker



- Granby FD's Tanker 1 is a 5,000-gallon tanker that is outfitted with an 8-inch rear gravity dump and a 500 gpm portable pump that is permanently plumbed into the tank.
- On June 16, 2009, GBW Associates, LLC conducted an offload test on the tanker to evaluate its ability to pump off water through 4-inch hose.
- The results of the test are presented here.

The Pump

- Tanker 1's pump is a Darley model HE18 pump driven by an 18HP Briggs & Stratton motor.
- The pump is rated to deliver 500 gpm at 20 psi discharge pressure



Test Set-up

- Three offload tests were done, all using the pump-off mode of operation.
- In order to produce reliable test results, the following constants were implemented for each test:
 - 300-feet of 4-inch hose
 - Pump at full-throttle
 - Suction and discharge valves fully open

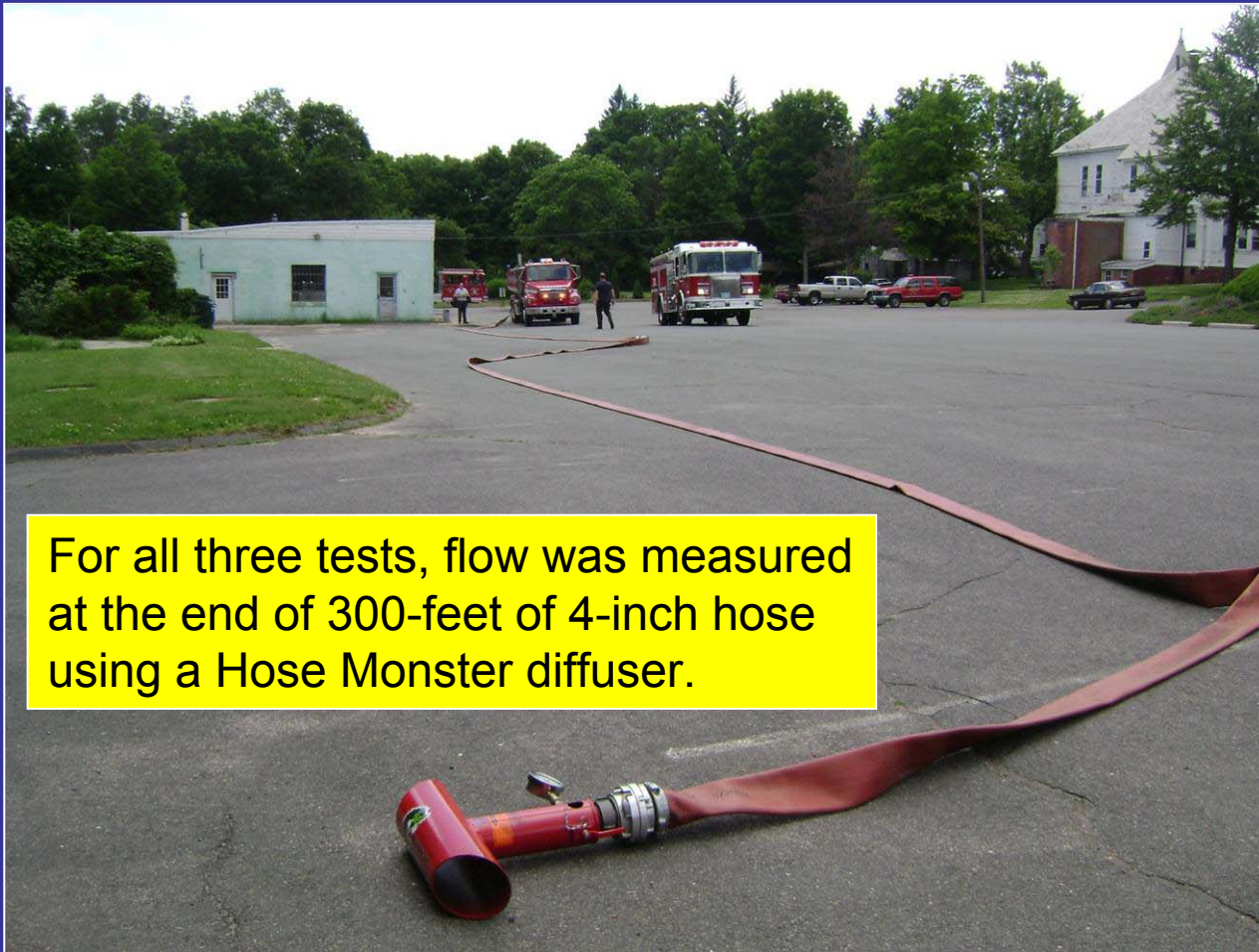
Test Set-up

- Three measurement instruments were used to obtain pressure readings during the test.
 - A Hose Monster flow test (diffuser) device was placed at the end of the hose line to measure the flow.
 - A 4-inch, in-line pressure gauge was placed at the 150-ft point in the hose line.
 - A cap gauge was placed on one of the pump's discharges to measure discharge pump pressure.

The Tests

- Three different tests were conducted in an attempt to determine if one pumping arrangement performed better than another.
 - Test #1
 - 300-ft of 4-inch hose connected directly to the pump's side discharge.
 - Test #2
 - 300-ft of 4-inch hose connected directly to the pump's rear discharge.
 - Test #3
 - 300-ft of 4-inch hose connected to a clappered siamese connected to the pump through dual, 25-ft sections of 3-inch hose

Flow Measurement Layout



For all three tests, flow was measured at the end of 300-feet of 4-inch hose using a Hose Monster diffuser.

In-Line Pressure Measurement



A 4-inch in-line pressure gauge was used to measure pressure in the hose line at the $\frac{1}{2}$ -way point.

Test #1 – Side Discharge Only



Results

Pump Gauge = 30 psi

Cap Gauge = 25 psi

In-Line Gauge = 0.5 psi

Hose Monster Gauge = 5 psi which is 415 gpm

Test #2 – Rear Discharge Only



Results

Pump Gauge = 28 psi

Cap Gauge = 25 psi

In-Line Gauge = 0.5 psi

Hose Monster Gauge = 5 psi which is 415 gpm

Test #3 – Both Discharges



Results

Pump Gauge = 25 psi

Cap Gauge = NA (no place to connect)

In-Line Gauge = 0.5 psi

Hose Monster Gauge = 5 psi which is 415 gpm

Summary

- All three tests yielded a flow no greater than 415 gpm.
- The pump's performance was clearly maximized and no more water could be moved using the given hose layouts.
- The problem with the low flow was due to the pump's performance at 500 gpm – it can only develop that flow at 20 psi discharge pressure, which is not enough pressure to move that amount of water very far through supply hose.

Recommendations

- Do not exceed 200 feet when attempting to pump off water at a rate of 400 gpm or greater. The friction loss in the hose is too great for the pump's ability. Any hose smaller than 4-inch will only further inhibit the pump's ability to pump water.

Recommendations

- Consider replacing the existing pump with a larger pump that can deliver 500 gpm at a higher discharge pressure. The problem is that room is limited on the vehicle for a larger pump. The department does have a 700 gpm pump that will produce 500 gpm at 50 psi – which should produce an improved flow – but not by much.

Recommendations

- Consider replacing the current tanker with a smaller tanker (3,500 gallons) that can also be equipped with a traditional fire pump rated at 1,250 gpm or greater.
- The key to having a traditional fire pump on a large tanker is that it can support a high flow fire attack until a tanker shuttle operation can be established.

Recommendations

- In the case of Granby FD's limited staffing and mutual aid response, there is a real need for the tanker to be able to support a 1,000 gpm flow using a "nurse tanker" configuration.
- The existing 500 gpm pump arrangement cannot support that type of fire attack operation.

Actions

- The leadership of the Granby Fire Department is actively pursuing changes to improve its water supply delivery process.
- One part of that pursuit is the acquisition of a large, vacuum tanker to replace the existing 5,000 gallon tanker.

Vacuum Tanker



Vacuum tankers have become more popular in recent years, primarily for their ability to refill without the need for additional personnel or equipment. The Granby FD leadership tested the vacuum tanker shown above and was impressed with its overall ability to move water with limited manpower.



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This program was developed by

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