

Front Suction Intake Flow Test Results Briefing

September 30, 2017

On September 30, 2017, the folks from GBW Associates, LLC and Water Supply Innovations, LLC conducted a number of flow tests on a variety of different makes, models, and styles of 6-inch, fire department suction strainers. Included in that work was a flow test on the front suction intake of a 2,250 gpm pumper. The purpose of the flow test was to demonstrate the reduced flow capability of a front suction intake on a mid-ship mounted fire pump. The results from the front suction intake performance tests are presented in this document.

All testing was done at the Hunterdon County Emergency Services Training Center in Annandale, New Jersey. Engine 1262 from the Glen Gardner Fire Company was used for each flow test. The pumper was equipped with a Hale QMax 2,250 gpm single-stage pump powered by a 515 hp diesel motor.

The Test Conditions

All test conditions were kept constant for each flow test:

- 20-feet of 6-inch Kochek lightweight suction hose connected to the pumper's officer's side main suction intake and then to the pumper's front intake;
- 3.52-feet of lift;
- 371-feet test site elevation;
- Air temperature between 60 °F and 69 °F;
- Water temperature between 60 °F and 70 °F;
- 50-feet of 4-inch hose from the pump's high-flow discharge supplying a 2-1/2-inch Hose Monster; and,
- Dual, 3-inch hoses, each 50-feet in length, each connected to a 2-1/2-inch discharge, and each supplying a portable monitor outfitted with an Akron Flow Test Kit and 1-3/4-inch smooth bore tip.
- A Task Force Tip Low Level Strainer with Float Attachment (A03HNX-JET-F) was used as the suction strainer for both flow tests. The Task Force Tips strainer was a top-performer in the strainer flow tests, thus it was chosen as the suction strainer for the front suction intake flow tests. Using the float attachment, the low level strainer's intake remained at a constant depth of 18-inches in the pond.
- The same person operated the fire pump.
- The same person oversaw pump operations and suction strainer deployment.
- The same person collected all physical data on each suction elbow.
- The same person recorded all gauge readings.

The only variable in the flow testing process was the suction intake to which the suction hose was connected.

Prior to flow testing the front intake on Engine 1262, a flow test was completed using the officer's side main suction intake. A Task Force Tips low level strainer with float attachment was attached to 20-feet of 6-inch suction hose which was then connected directly to the pumper's officer's side suction intake. This test provided a baseline for comparison of the front suction intake. For each flow test, data was recorded at peak output flow, which in most cases was also the point at which pump cavitation began.

The Front Suction Intake

	
<p>Glen Gardner Engine 1262 2,250 gpm Hale Q-Max Pump Front Suction 6" NST Fitting on 5" pipe</p>	<p>Task Force Tips Low Level Strainer w/Float A03HNX-JET-F)</p>

Front Suction Intake Flow Test Results

Device	Flow Achieved (gpm)	Motor Speed (rpm)	Vacuum Reading ("Hg)
Driver's Side Main Suction Intake	1738 gpm	1150 rpm	16.5 in
Front Suction Intake	860 gpm	900 rpm	25.0 in

General Notes About the Flow Tests

- The baseline flow test measured maximum flow with 20-feet of lightweight suction hose connected directly to the driver's side main suction intake. A TFT low level strainer with float attachment was used.
- All flow readings were obtained using remote test gauges connected to a 2-1/2" HoseMonster flow diffuser and to an Akron Flow Test Kit on a portable deluge gun outfitted with a 1-3/4-inch smooth bore nozzle.
- Motor speed readings were obtained using the digital tachometer on the pumper's pump panel.
- Vacuum readings were obtained using a remote test gauge connected to the pump's vacuum test port.

- All test gauges were either new or recently calibrated. All test gauges were also field verified the morning of the flow tests. Therefore, all flow readings are expected to have a 5% or less margin of error.

The Findings

The 2,250 gpm pumper was unable to even flow 1,000 gpm using the front intake. Experienced pump operators know that under draft conditions, most front intakes on mid-ship mount fire pumps are poor performers. This flow test validates that experiential knowledge. Engine 1262's front intake performed at 49.4% of the pumper's side suction intake performance. Factors impacting this reduced performance include: 5-inch pipe, numerous bend/elbows in the 5-inch pipe, and the location where the suction pipe enters the pump.

The front intakes on pumpers are rarely included as part of the fire pump's certification performance testing. Thus, little data is available about the flow capability of any given front intake – other than we know that flow is most likely is reduced under draft conditions. Therefore, for those fire departments that draft and have front intakes on their pumpers, it is imperative that the front intakes be flow tested so that the flow limitation is determined prior to the “big water” event.

Many thanks to all of the folks and fire departments that contributed time, equipment, and funds in support of this project. A complete listing can be found in the project's “official” white paper.

Questions or concerns about the flow test results can be directed to Mark E. Davis, CFPS at www.gotbigwater.com by emailing thebigcamel@gotbigwater.com or by joining the Members Area of www.GotBigWater.com.