

Demonstration: Trident Pump - high pressure, high volume, versatile pump¹

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Background

Alberta Agriculture and Forestry asked FPIinnovations to evaluate the patented Trident Pump System developed by Younkers Welding for the system's suitability for wildfire operations. This report summarizes the author's observations and thoughts.

Methods

An evaluation team consisting of Ray Ault from FPIinnovations and Roy Campbell and Derek Gough from Alberta Agriculture and Forestry met with the Trident Pump Team near Athabasca on August 11, 2017. After a briefing of the system components, the evaluation team travelled to the banks of the Athabasca River to document the pump deployment, operation, and demobilization.

Results

System Components:

The self-contained system is transported on a 24-foot flat deck towed by a pick-up truck. Unit one is a high pressure, high volume pump mounted on a 6-wheel utility vehicle (Figure 1). The pump unit includes a 6-inch diameter suction hose with a foot valve, external priming pump, gauges to monitor turbo temperature, and a thermal infrared temperature camera to monitor bearings. Unit two is a hose delivery and recovery vehicle consisting of a hose reel mounted on a 6-wheel utility vehicle. The hose reel unit includes a back check valve, multiple lengths of 4 inch diameter lay-flat hose, cam lock hose connectors, Rainbird high volume sprinklers (11/16 nozzle orifice) and pressure gauges.



Figure 1. Pump and reel units on trailer

¹ 550 lb pump weight for this evaluation

Deployment:

Deployment consisted of backing the utility vehicle into the Athabasca River, attaching a short length of suction hose, priming the pump, and spooling-out the hose up the moderately steep river bank to a flat area above the river. Eight 300-foot hose lengths were used. Cam lock fittings attach the hoses, and five sprinklers were attached to the cam lock fittings (Figure 2). A pressure gauge was connected to an end cap at the terminal end of the hose. Vertical distance from the river to the end cap was approximately 350 feet. Time required for deployment and delivering water was under 30 minutes (Table 1). A three-person team set up and operated the system.



Figure 2. Cam lock fitting and 1½ inch fitting for sprinklers

Table 1 Time distribution for Trident Pump system deployment

	Time (Minutes)
Park	0
Unload, travel to river, set up pump	16
String hose, set up sprinklers	22
Water flowing from sprinklers	27

Operation:

The pump system was continuously operated for 35 minutes at various pressures and flow rates. For this demonstration, the optimal flow rate for the five sprinklers at 3,750 rpm (at the pump) was approximately 120 gallons per minute for each sprinkler, or 600 gallons per minute for the entire system. End cap pressure was 40 psi. Casting distance for the sprinklers was not measured, however, with the sprinklers spaced at 300 feet apart; gaps between the sprinklers were noted.

Demobilization:

The takedown process begins with shutting down the pump and removal of suction hose and the first 100-foot hose length up to the back-check valve. Once these three steps are completed, unit one is ready for loading on the trailer. A two-person crew then spools the 4 inch hose using the reel system on unit two (Figure 3). Complete retrieval of the hose and loading of both utility vehicles back on the trailer took less than 60 minutes.



Figure 3. The reel system on unit two spooling the 4 inch hose

Discussion and Comments

As a self-contained and mobile water delivery system, the Trident Pump is a quick-deploy tool. We are unaware of any similar pump system that delivers high water volumes or pressures from a relatively small pump that can easily be transported to the fire line. The Trident Pump system fills a gap between much larger agriculture pumps and the common small pressure pumps used today on wildfires. The approximate 500 lb weight coupled with water moving capacity makes this pump unique in our experience.

Several fire line situations were identified where the volume and pressure of the Trident Pump system would be useful. These include:

- Mainline water delivery to fill relay tanks, mobile equipment, or engines where topography limits the access. The system has the potential to deliver 1,000 gallons of water a minute over a one-mile distance.
- Pressurized water source for sprinklers in both the Wildland Urban Interface and to support wildfire containment lines.
- Source for moving high volumes of water for extensive ground fire, peat fires, windrows, or debris extinguishment.
- Although the demonstration included the pump assembly mounted on a utility vehicle, the pump can be removed and transported separately for use on remote fly-in fires. Each 300-foot length of 4 inch hose weighs 170 lbs. Trident Pump has an inventory of 12,500 feet of four-inch hose and can deploy up to 100 feet of suction hose.

Conclusion

The goal of this product demonstration was to evaluate the suitability of the pump system for use in wildfire operations. Although the Trident system is operational and ready for deployment, refinements to both equipment and tactics may be required given varying wildfire scenarios.

Future

It can take time for operations to fully imagine the many possible ways new tools can be used; however, only through usage will those new tools develop their full potential. This product would benefit from case studies which further document actual wildfire deployment and firefighter comments and ideas.