To: **Utah Transit Authority**

From: **SpillX**

Subject: **SpillX Testing Results**

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Background

The Spill X system was developed to improve fueling rates, reliability and safety associated with locomotive fueling. The system uses a mil spec standard for dry break fueling connections used in the aviation industry for decades. Spill X is comprised of a dry-break nozzle installed on the fueling platform, and a receiver and float valve installed on the locomotive. Installation of the system takes approximately 15 minutes and requires no other modification to the locomotive or the fuel crane.

UTA has ~18 locomotives that are rotated in and out of service. There are plans to expand both the number of routes and number of locomotives. Locomotives are fueled from one central point and considered captured power, as there is no interchange with other railroads.

A fueling demonstration was conducted on April 24th, 2012 at the UTA Salt Lake City facility.

UTA Fueling Platform

Currently the facility uses the conventional fueling nozzle. Two different fuel systems can provide fuel delivery to the platform. The main system fuels at a rate of ~85 GPM. The lower capacity system (older) reportedly fuels at a rate of ~60 GPM. Only the main delivery system was used for the SpillX testing—the older system was not used for this demo install. Submersible pumps located in the storage tanks prime the gear pumps that feed the infrastructure. There are two gear pumps, but one runs at a time, switching back from one fueling event to another. The gear pump is a Roper Pump, with placard stamping of Figure 3722 MBHF, Spec 16559. Relief valves are positioned down-stream of the pumps that feed back into the tanks. 3” pipe feeds is used until the fueling platform, which is then reduced to 2” pipe. An LC totalizer, variety of elbows, and stainless steel hoses with internal wire re-enforcement are at the platform.

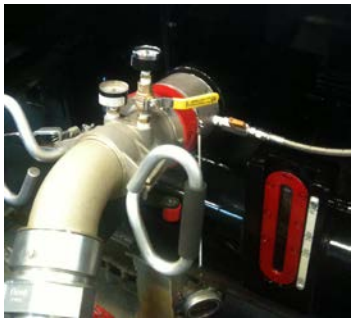
UTA locomotives are currently fueled to ~2400 gallons. Fueling is stopped manually at the Fuel Master Control station. There have been problems with the automatic shut-offs not working properly and fluid hammer problems with the current system.

Testing

Test 1 – Installation of SpillX

The SpillX system was installed on a UTA locomotive, including receiver, float valve, and ball valve. The ball valve was installed to test receiver functionality, and simulate a full tank. The nozzle was installed on the platform with the following fueling results:

- Pressure at gear pump: 43 PSI
- Pressure at platform: 42 psi
- Pressure at nozzle: 4 psi
- Flow rate: ~85 GPM
- A nozzle shut down showed a smooth, hammer free, shut-off
- 60 psi dead head pressure measured after fueling stopped



Test 2 – Installation of SpillX, Throttling By-Pass valve to raise pressure

By throttling the bypass valve while fueling to raise the operating pressure:

- Pressure at gear pump: 100 PSI
- Pressure at platform: 70 psi
- Pressure at nozzle: 10 psi
- Flow rate: ~120 GPM
- SpillX receiver successfully shut down
- SpillX receiver successfully shut off when the tank was filled to ~2300 gallons
- 120 psi deadhead pressure measured after fueling stopped.

Discussion

Fueling rates were not changed for test 1 – i.e. the nozzle is not the restrictive piece on this fueling platform. The platform plumbing is quite restrictive in terms of size of plumbing, totalizer, elbow turns, and stainless steel hosing with internal wire reinforcement. This can also be shown by the differential pressure between the fueling platform and nozzle (ΔP 38 psi @ 85 GPM – Test 1 & ΔP 60 psi @ 125 GPM – Test 2)

Conclusion

Test results indicate that the SpillX could be added to the UTA fleet without any changes in the infrastructure. This would not change the fueling rate, however would bring the benefits of overfill protection, reduced fluid hammer, inherent safety features of closed dry-break type fueling system.

Improvements on UTA's behalf to the fueling platform infrastructure would greatly increase fueling rates. These would include using larger plumbing, less turns, and fueling hoses with smooth internal bores. This, in conjunction with the SpillX system, could maximize fueling rate potential.