Environmental Upgrades to Aviation Hydrant Fuel Systems

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Introduction

Current trends in airport operators' heightened sense of environmental stewardship, coupled with tightening regulations, have made it challenging for existing hydrant fuel systems to meet these commitments. Faster aircraft turnarounds and increasingly complicated flight schedules also place demands on hydrant systems that could affect these systems' environmental integrity. Therefore, the importance of proper hydrant fuel system maintenance and upgrade processes will continue to grow in conjunction with aviation industry advances.

An environmental upgrade program to an existing hydrant fueling system could involve the following considerations:

- Compliance with anticipated adoption of more stringent environmental regulations such as the proposed API/IP 1540 "Guidelines for Testing the Tightness Integrity of Aviation Fuel Hydrant Systems"
- Improvement of system operation and reliability
- Installation of positive isolation valves to provide smaller testable hydrant segments
- Installation of additional surge suppression capacity to accommodate modern operations for which the system might not have originally been designed
- Accomplishing these upgrades while the airport conducts ongoing operations at a time when airlines are pushing for increased on-time operations and low fares

Background

Current leak detection technologies sharply limit the amount of volume that can accurately be tested, and existing hydrant loops are often impossible to isolate in segments of sufficiently small size to ensure accurate testing. There is also an ever-present risk that hydrant loops might suffer surge conditions beyond the system's design, as airport fueling operations evolve to accommodate more frequent and time-sensitive fueling to support point-to-point carriers. Finally, airports with hydrant systems can be among the busiest in the world, supporting low-fare carriers, international carriers, and critical cargo and logistics operations. Therefore, detailed phasing plans to install upgrade components in the hydrant system must be devised so that impact to airline and cargo operations is minimized.

Regulatory Trends

Compliance with anticipated regulatory trends can be a guessing game and costly if not considered properly. Current technologies in system leak testing need to be evaluated against current regulations (i.e., compliance requirements as mandated by the American Petroleum Institute, US Environmental Protection Agency, and similar regulatory bodies) while offering adequate performance that will keep up with industry trends. The American Petroleum Institute's proposed API/IP 1540 standards consider a volume of approximately 52,834 gallons and pressures of 86.8 psig to be acceptable for new sections of piping in apron areas. Hydrant leak reviews should be conducted immediately on first installation and at least yearly thereafter to ensure that these criteria are met or exceeded.[1]

Installation of Upgrade Components

The ultimate challenge in complying with anticipated regulatory trends is to modify an in-service hydrant system. The key to doing so is to make modifications with little or no impact to operations while simultaneously ensure the safety of workers performing the modifications. Timing and logistics are critical elements of such a process, most often requiring work to be performed at night in order to shut off the system, modify it, and return it to service by the beginning of daylight operations the following morning.

In some cases, positive isolation valves originally designed as part of the system can be shut, effectively isolating a segment of piping that is small enough in volume to allow the segment to be pumped out in a reasonable amount of time. This allows modifications to be made without significant spills or exposure to workers. In other cases, however, the distance between existing isolation valves is too great to allow the segment of piping to be pumped out in a reasonable amount of time given the available work window. In these cases, techniques borrowed from the pipeline industry must be employed.

Project Procedures

The following procedures, which were recently implemented at Atlanta's Hartsfield-Jackson International Airport, are representative of acceptable methodology:

- Install FAA-approved safety barriers at each valve pit.
- Install Stopple® valve[2] and plug fuel line.
- In combination with Stopple® valve plugging, isolate line segments by shutting existing manual valves in nearby pits.
- Pump fuel from isolated line segments.
- Install prefabricated ancillary equipment and transfer electrical service as needed.
- Provide field repair of coating where required.

Project Scheduling and Phasing

Due to the operational impact of the construction process on busy airports, most leak detection projects require extensive phasing. Construction phasing plans should focus on online pipeline tapping technologies and coordinate work around aircraft operation times. Schedules must be created to ensure all pit modification work takes place during a specified work window, for example 12AM to 5AM. Material delivery, equipment setup, and valve excavations can sometimes take place outside of the work window, permitting a given valve pit to be prepared prior to modification. Work windows should be defined so that all modifications to a single isolation pit can be completed during one work window, allowing operations to resume by the end of the window. If a pit modification cannot be completed in a single window, arrangements for holdover of materials and equipment should be made with the construction contractor and airport operations personnel.

[1] API/IP 1540. "Annex E: Guidelines for Testing the Tightness Integrity of Aviation Fuel Hydrant Systems." *Draft Fourth Edition for API/IP Ballot.*

[2] Stopple® is a registered trademark of T.D. Williamson, Inc.

Phased project work typically entails shutting off fuel to the designated pit via valve or line plug, removing designated existing equipment, installing new equipment, flushing the fuel line, and returning the line to service. All new piping spools should be prefabricated, tested, assembled, and ready for installation prior to shutting down any line segments. Additionally, all materials and equipment should be acquired prior to initiating any on-site work.

Conclusion

This paper demonstrates that, through proper planning and scheduling, it is possible to design and engineer large-scale preventative adjustments to infrastructure even at the busiest facilities, such as aviation consulting firm Prime Engineering, Inc. has recently done at Hartsfield-Jackson Atlanta International Airport. Additionally, the project highlights the usefulness of Stopple® valves as a leak detection "workaround," enabling valve pits to be isolated and checked for leaks without disrupting the overall flow of fuel.

Proper design modifications will allow leak detection of the hydrant system to be carried out on an annual basis, or more frequently as may be required in the future. Additionally, installation of additional surge protection in the fuel piping system enables airports to meet their environmental and safety commitments under contemporary airport operation demands. Combined, these procedures will allow upgrade of hydrant fuel systems for future needs while simultaneously maintaining "business as usual" for airlines, cargo, and passengers.