



CASE STUDY: Reduce Maintenance Concerns and Costs on Gas Turbine Fuel Control Valve Actuation

Non-incendive Jet-Pipe® EHSV

3/28/2020

The Problem

Premature failure of electrohydraulic servo valves (EHSV) used to control movement of actuators on fuel control valves were creating headaches and consuming maintenance dollars at the Marcus Hook Energy Center. Originally owned by NextEra, and operated by Florida Power & Light, the fleet manager of this 790 MW combined cycle power plant began looking for a solution.

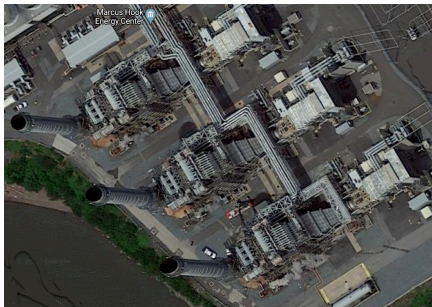


Photo courtesy of Google

Each of the three GE 7FA.03 (now updated to .04 spec) turbines were averaging 6,200 hours and 210 starts per year. The expected service life of the original equipment servo valves was 32,000 hours, but many were experiencing failure every six months

(3,100 hours). These failures led to valves being repaired or replaced at every other outage. The original servo valves were spec'd and supplied as original equipment by GE.

The Root Cause

Dirty hydraulic fluid and varnish formation are two of the primary enemies of EHSV's. The condition of the electrohydraulic control oil at Marcus Hook was especially demanding. A fluid analysis was not conducted, but visual inspection of system oil from an open port showed signs of contamination. (see photo to the right)

Summary

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Improve turbine availability and reliability while extending service life of servos on critical engine control applications.



Parker Jet-Pipe® Electrohydraulic Servo Valve
GE Specification 312A6077



Open port on Fuel Control Valve Actuator


GE Lube Oil Recommendation Document GEK32568K discusses lube oil varnish formation and its negative impact to turbine availability and reliability. Small orifices and low-flow areas, along with the reduced duty cycles of EHSV's, were found to be especially susceptible to varnish formation. Varnish build-up on the EHSV orifice and spool can lead to sluggish or inoperable valves, often resulting in an unexpected turbine trip. Parker Jet-Pipe® servos were designed with strong resistance to contamination and varnish build up and have a unique ability in case of failure → a return to zero or "fault safe" design. This means that if a valve becomes inoperable it will not fail to a "hard over" or extreme position.

The Solution

Parker Hannifin's trademarked Jet-Pipe® electrohydraulic servo valve has been used for decades in flight control systems for commercial passenger planes and military fighter aircraft. These valves were selected for a side-by-side test and evaluation. A total of 12 Parker Jet-Pipe® electrohydraulic servo valves were installed on the gas turbines at Marcus Hook.

The Result

After 19,000 fired hours, 520 starts and nearly three years of operation without incident, one Parker Jet-Pipe® servo valve was removed for testing and analysis. NOTE: The original equipment valves had to be serviced six times over this same time period. Laboratory results document that the Parker Jet-Pipe® servo was within new performance requirements.

	CONTROL SYSTEMS DIVISION FLIGHT CONTROL & HYDRAULIC SYSTEMS PARKER AEROSPACE GROUP PARKER HANNIFIN
DOCUMENT NAME:	
EHSV Engineering Evaluation Report	
Marcus Hook Power Plant	
447300-1009 S/N 0009	

As of December 2019, the Parker Jet-Pipe[®] EHSV's have **over 60,000 hours** of trouble-free operation and remain in service.



*Parker Jet-Pipe[®] on
Fuel Control Valve*

Marcus Hook Energy Center has saved thousands of dollars in repair and replacement costs, eliminated many man hours of maintenance, and avoided numerous turbine trips.

The Parker Jet-Pipe[®] is fully approved by GE for heavy-duty gas turbines and has been added to **GE specification 312A6077**.

Made in the USA at the Parker Aerospace Control Systems Division in Dublin, Georgia, Jet-Pipe[®] is a “drop-in” replacement for existing OEM EHSV on fuel control valves making changeouts quick and simple.