TURBINE TIPS
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OilGear Fuel Pump Stroke Indicator

Applies to: General Electric MS5001L & LA gas turbines, circa 1967 - 1969.

How do I know that my OilGear fuel pump is stroking properly?

GE gas turbines manufactured in the late 1960s utilized ***OilGear*** fuel pumps, if they burned #2 distillate oil. These are variable-displacement, radial piston pumps with a maximum flow of 37 gallons per minute. Maximum output pressure is 1100 psig discharge pressure when operating at their rated speed of 1800 rpm.

Fig. 1: Typical OilGear Fuel Pump on MS5001LA gas turbine

OilGear fuel pumps, like the one shown above in **Figure 1,** come with a stroke indicator underneath the pump. The stroke indicator moves upward (into the pump) as the Variable Control Oil (VCO) pressure increases. The pump begins to stroke when VCO pressure increases above 40 psig. It reaches maximum stroke (indicator disappears into the pump body) when VCO pressure reaches 200 psig. The total travel of the stroke indicator is .320 inches. See **Figure 2** below.

It is difficult to measure this pump stroke using a dial indicator, even if it has a magnetic base. Often the pump vibration makes the needle wobble and difficult to read. Although less accurate, it is better to use a ***vernier caliper,*** with a digital dial, to measure the pump stroke. Remember: the indicator moves upward and "disappears" into the pump with increasing VCO pressure. A small **groove** around the perimeter of the indicator gives a good reference point.

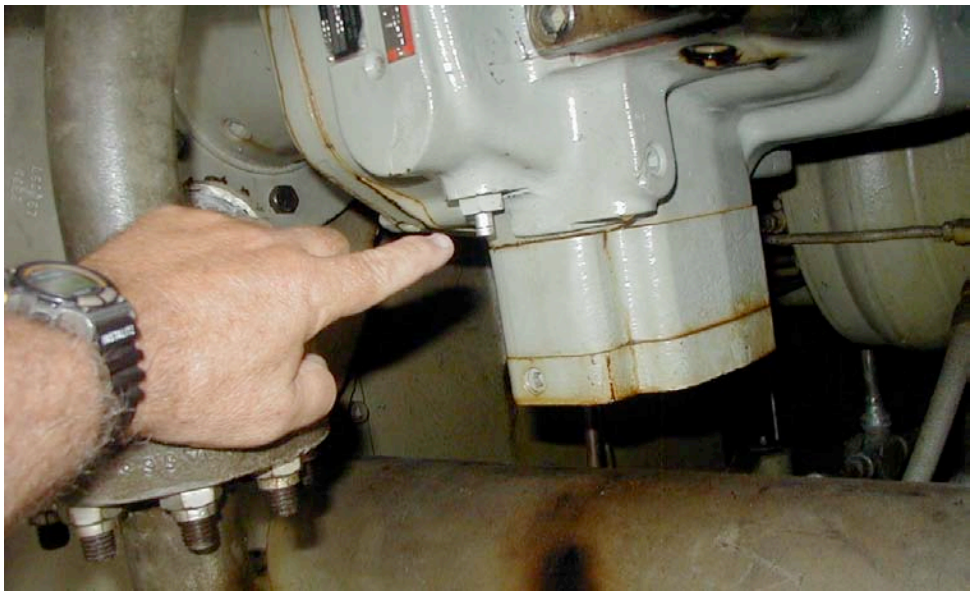

Fig. 2: Stroke Pump Indicator (with small groove around perimeter of extension)

The VCO versus stroke equation: $S = (VCO - 40)[(.320) \div (200 - 40)]$

Simplifying $S = .002\ (VCO) - .08$

Example: for Firing VCO, $S = .002\ (90) - .8 = .100$ inches See chart below.

All Tests at Cranking Speed

Test Point	VCO Pressure (psig)	Pump Stroke (inches)	Comments (Test Switch 43FS)
Zero	< 40 psig (no stroke)		43FS in the **Normal** (off) position
Zero Effective	VCO > 40 psig	~ 0	Pump begins to stroke @ VCO > 40 psig
Minimum	VCO = 72 (typical)	.064	43FS test switch in **Minimum**
Firing	VCO = 90 (typical)	.100	43FS test switch in **Fire**
Accelerate	VCO = 120 (typical)	.160	43FS test switch in **Accelerate**
Maximum	VCO = 200 (typical)	.320	43FS test switch in **Maximum**

The schematic below in **Figure 3** depicts the operation of the fuel pump. VCO pressure shown entering the top of the servo unit can be thought of as the ***"brains"*** that signals the pump to stroke. The amount of fuel flowing is a function of VCO and pump speed (called NHP). Constant Control Oil (CCO) is the ***"brawn"*** of the system. The pump strokes as a result to the differential oil pressure acting on the control and loading pistons. The rotating cylinder block contains the pistons that do the pumping of the fuel whenever there is an offset of the control and loading pistons.
From GE Control Specifications, fuel flow (FF, in gallons per minute) can be calculated by the following formula:

$$FF = .21 (VCO - 40) \times (\% NHP \div 100)$$

Examples: Full Speed/No Load, FF = .21 (80-40) (100 ÷ 100) = 8.4 gpm
Base Rated Load, FF = .21 (170-40) (100 ÷ 100) = 27.4 gpm

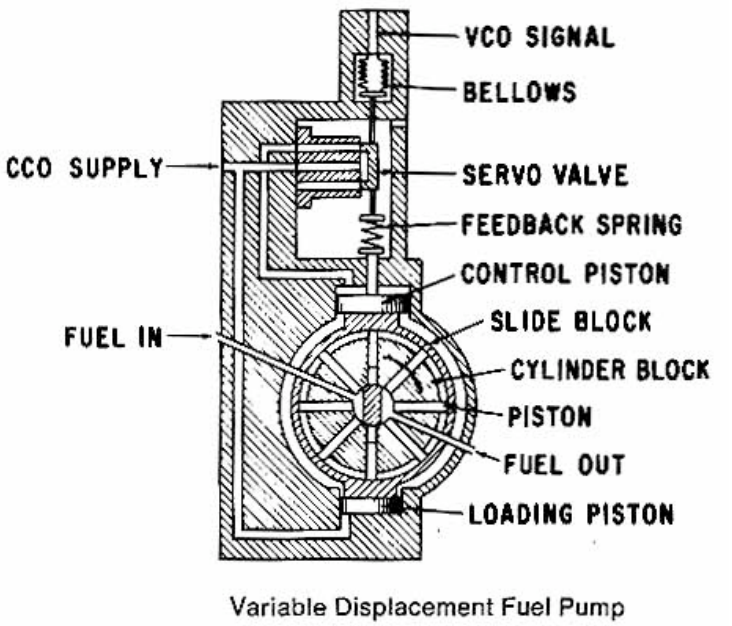

Fig. 3: Schematic of OilGear Fuel Pump

Fig. 4: VCO Servo Actuator for OilGear Fuel Pump

For more information on ***OilGear*** fuel pump operation and pump services, contact ***Dave Lucier*** of ***Pond And Lucier, LLC***. Not only does ***PAL Engineering*** offer complete reconditioning services, but we can provide field engineers to identify and solve problems with these pumps on site.

Related Topics: April, 2003