

Electronic Propellant Feed System Centrifugal Pump Performance Test

This description of procedure defines the conditions for the hydraulic testing of the electric feed system centrifugal pump.

Overview

The objectives of testing the electric feed systems centrifugal pump are to:

- Document system pump performance.
- Establish the system curve for the pumping system.
- Determine the operating point of the pump; i.e. the point where the pump's impeller curve crosses the system curve with the discharge valve throttled and with the discharge valve fully open.
- Assess the match between “full flow”—flow delivered by the EFS pump with the discharge valve fully open—and the actual design flow requirement.
- Assess the implications of modifying pump performance via trimming the impeller, adding a cutwater, and using impellers of differing solidity.
- Detect and diagnose other control or performance problems.

1. EFS Pump Performance Testing

- 1.1 **Verify all EFS prefunctional checklists are complete.** Prior to performing any functional tests, the commissioning pre-start, start-up verification should be completed, Prefunctional checklist items include, but are not limited to, the following:
 - 1.1.1 **[Insert a list of things that should occur during correct EFS operation in this step of the test.]** Control system point-to-point checkout is completed to ensure all EFS input/output points are wired correctly, and all actuators and relays or motor starters respond to control signals.
 - 1.1.2 Power is provided to pump assembly at proper voltage and phase rotation. As an alternative to verifying phase rotation, pump rotation should be verified.
 - 1.1.3 The electric feed system has been proportionally balanced with all control valves fully open.
 - 1.1.4 All necessary sensors are calibrated.
 - 1.1.5 Locations of EFS pump, valves, and other system components are clearly and correctly located on as-built drawings.

EFS Standard Operating Procedure

Preliminaries

1. With discharge valve closed, suction valve of the pump is opened which causes fluid flow to the impeller and fills the volute.
2. Open the vent (drain) valve which is on the discharge line before the discharge valve of the pump .which will cause all air to move out of the casing and flow loop.
3. When some quantity of the fluid exits from the vent valve close it.
4. The pump discharge and suction valves are adjusted to the fully open position and the motor speed set to zero.
5. The electrical supply and motor drive switch are turned on. The motor control knob is adjusted slowly to [insert]. The system is ensured to `have no leaking. All the gauges etc. are checked to reduce the motor speed back to zero.

Test Process

1. Suction valve and discharge valve is fully open. The maximum speed N (rpm) is selected by adjusting speed control to [insert] %.
2. Discharge valve is fully opened and water is allowed to circulate. The volume of flow indicator is noted and decides suitable increments in flow to give adequate sample points.
3. Allow the pump to attain its capacity read from the discharge line pressure gauge. When the readings are stable, record all test measurements.
4. The discharge valve is then slowly adjusted (decreasing flow) to the next desired capacity point.
5. Step 4 is repeated until all flow increments have been recorded.
6. All the gauges etc. are checked to reduce the motor speed back to zero and power down the EFS system.

Test Precautions

- Exercise care when changing operating RPM if the equipment served by the pump is in operation.
- Avoid sudden flow changes to minimize the potential for water hammer, especially when throttling the discharge valve for a shut-off test.
- Exercise proper caution when working around live wiring and terminals and taking voltage or amp readings.
- Exercise proper caution while working around the rotating parts of the pump.
- **DO NOT** let EFS centrifugal pump operate for long periods of time at zero flow.
- **DO NOT** operate pump in reverse direction, this could cause severe damage to the impeller shaft.
- **DO NOT** run EFS pump dry.

Troubleshooting

For team to look out for. (*Remove after tests are performed*)

1. The shut-off head, this is the maximum head that the pump can achieve and occurs at zero flow. The pump will be noisy and vibrate excessively at this point. The pump will consume the least amount of power at this point.
2. The best efficiency point B.E.P. At this point, the impeller is subjected to minimum radial force promoting a smooth operation with low vibration and noise. The pump will consume the power corresponding to its B.E.P. rating at this point.
3. The maximum flow point, the pump may not operate past this point. The pump will be noisy and vibrate excessively at this point. The pump will consume the maximum amount of power at this point.

Characteristic noise of cavitation: [Characteristic noise of cavitation](#)

