Shippensburg Pump Company, Inc.
BOILER FEED ● CONDENSATE ● DEAERATOR ● VACUUM
1 Schwenk Drive
P.O. Box 279
Shippensburg, PA 17257-0279
Phone: 717-532-7321
Fax: 717-532-7704
www.shipcopumps.com

3 Pumps Feeding 2 Boilers

Perhaps the most common (and often misunderstood) boiler feed setup is 3 pumps feeding 2 boilers. It sounds so simple but decades of economic and technology constraints have produced a plethora of control and piping configurations. This document is meant to assist engineers and customers in choosing the most effective control sequence for their application.

Typical Control Sequences

Dedicated with Manual Standby

Manual staging

See Figure 1. Pumps are ordered 1, 3, 2. Boiler 1 calls Pump 1. Boiler 2 calls Pump 2. In the case of a pump failure on Pump 1 or Pump 2, Pump 3 has a selector switch to determine if it will be called by Boiler 1 or Boiler 2. Manual isolation valves separate Pump 3 from pumping to Boiler 1 or Boiler 2 so a technician must be physically present to bring on the standby. *This configuration has 1 manual standby pump and no alternation.*

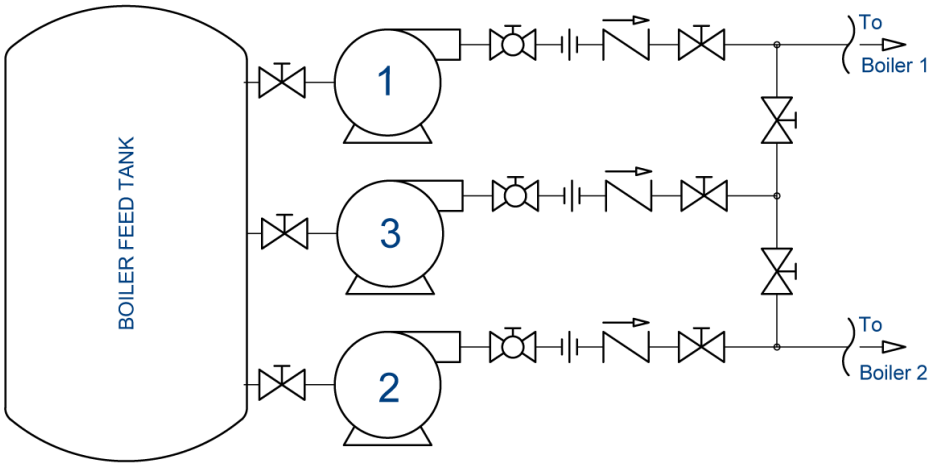

Figure 1: Dedicated with Manual Standby

Dedicated with Automatic Standby

Partial automation, no PLC required

See Figure 2. Pumps are ordered 1, 3, 2. Boiler 1 calls Pump 1. Boiler 2 calls Pump 2. In the case of a pump failure on Pump 1 or Pump 2, Pump 3 will be energized by one of the pressure switches which will sense that the primary pump did not produce pressure. Solenoid isolation valves separate Pump 3 from pumping to Boiler 1 or Boiler 2. A solenoid opens, when Pump 3 turns on, to send water in the direction of the failed pump. *This configuration has 1 automatic standby pump and no alternation.*

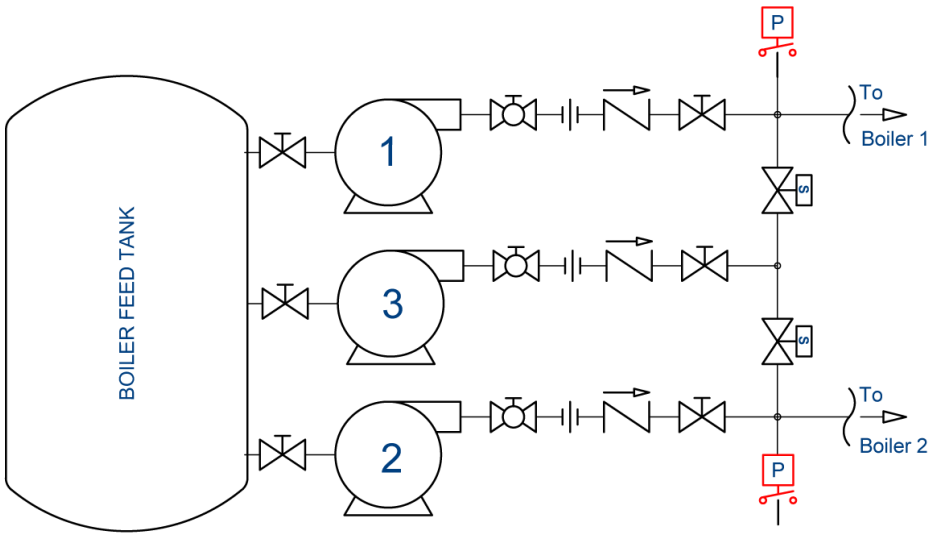

Figure 2: Dedicated with Automatic Standby

Lead on Boiler Call, Standby on Pressure Drop

Fully automated staging through the Shipco® Aqueous™ system

See Figure 3. Pumps are ordered 1, 2, 3. If either boiler calls for water, the lead pump will energize. If the lead pump cannot maintain the flow demand, the pressure transmitter will register pressure sag and stage on standby pump(s) until the pressure setpoint is met. If flow demand reduces, the pressure transmitter will register pressure increase and stage off standby pump(s). The lead pump will stay on as long as either boiler calls for water. When neither boiler calls for water, all pumps shutoff instantly and the required number of standby pumps resets to 0. Solenoid isolation valves dictate if water goes to Boiler 1 or Boiler 2 and are energized by the boiler level calls. Pumps can alternate based on the lead pump's runtime or based on start/stop cycles. *This configuration has 2 automatic standby pumps and alternation.*

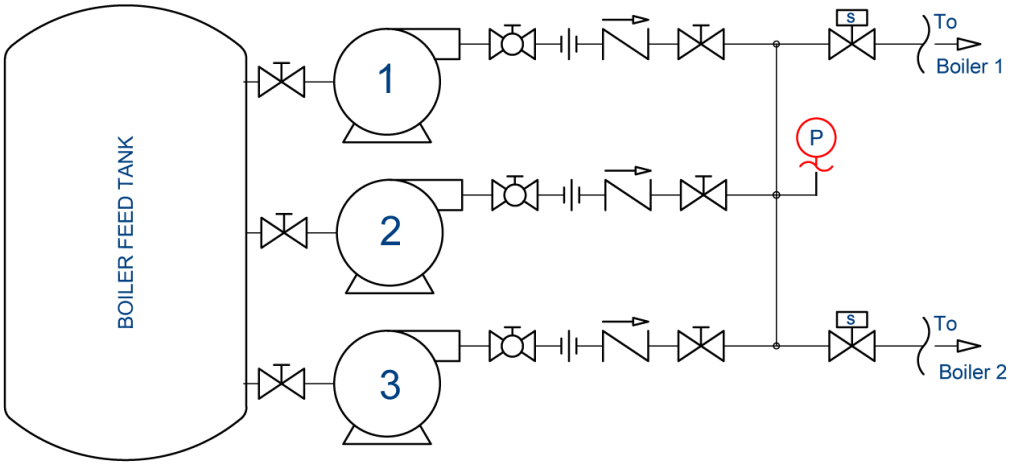

Figure 3: Lead on Boiler Call, Standby on Pressure Drop

Additional Automation through *Aqueous*™

Add VFDs

ASME code PG61.1 dictates boiler feed pumps must be capable of producing 103% of the safety relief valve setting. All boilers operate below their safety relief valve setting. If the differential pressure between the pump discharge and the boiler drum is greater than 40 psi, water hammer and excessive wear become serious concerns. A variable frequency drive (or VFD), programmed to reduce pump speed based on boiler pressure, can keep the differential within safe limits while satisfying ASME code for emergencies and reducing amp draw from pump motors to increase system efficiency.

Use Modulating Feed Valves

Steam demand is not on/off. It is a time dependent, moving target. Why design boiler feed systems to be on/off where they can't be tuned to match the live steam load? Using a modulating feed valve between the boiler and boiler feed pumps causes the boiler to hunt less, smooth out swing loads, puts less stress on the burner controls, reduces short cycling, and improves system efficiency by regulating feed water supply to match boiler steam output.

Both VFDs and Modulating Feed Valves

Pump speed can be ramped base on boiler pressure and flow demand for huge power turndown, increased efficiency and reduced wear on pumps. Coupled with maintaining multiple pumps at low speed, this is the most efficient system on the market today.

AQUEOUS™
Automated Water Controls