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TechNotes

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Testing Fire Pumps with Pressure Relief Valves Piped Back to Suction

Many fire pumps installations have main (pressure) relief valves on the discharge side of the pump. Some of these relief valves are designed to open and flow water every time that the pump is in the churn condition. In other situations, the relief valve is only there in case the pump turns too quickly and starts to over-pressurize the system, so the relief valve will not open under normal operating conditions. This article is only concerned with the situation where the relief valve is designed to open under normal operating situations when the pump is in the churn condition.

In many situations, the discharge from the relief valve is piped to the outside or to a drain. In these conditions, hundreds (or even thousands) of gallons of water can be dumped from the relief valve during the churn test of the fire pump, which is typically performed weekly. In order to prevent this loss of water, some designers have decided to pipe the discharge from the relief valve back to the suction side of the pump.

This article will not get into the pros and cons of piping the discharge from a relief valve back to the suction side of the pump. Those discussions have appeared in other articles in the NFSA family of publications. The fact remains that at various times in the history of NFPA 20, it has been permitted to pipe the discharge from a pressure relief valve to the suction side of a pump, allowing the water that goes through the relief valve to recirculate through the pump. This article will address the test procedures for the situation where the relief valve discharge is piped in this manner, back to the pump suction.

Under the 2011 edition of NFPA 25 (and all of the previous editions), there was no special test procedure for pumps where the relief valve discharge was piped back to the suction side of the pump. The pump would be started for the churn test (either manually or automatically through a timer) and a person in the pump room would record a number of pieces of data including the suction and discharge pressures as well as any indication that the pump was getting too hot.

For the 2014 edition of NFPA 25, the committee has made a significant change. The NFSA Engineering Staff tried to talk the committee out of the change. We even brought the issue to the NFPA membership to vote on it. At that NFPA meeting, the members agreed with us that the committee was making a big mistake, but the committee was able to retain the change in the standard anyway. The NFSA Engineering Staff tried to get the NFPA to issue an emergency Tentative Interim Amendment (TIA) to NFPA 25 to get them to fix the problems with this change, but the TIA did not receive the support it needed to pass.

So, under the 2014 edition of NFPA 25, it will now be very difficult to run the regular churn test on fire pumps that were correctly designed in accordance

Upcoming Technical Tuesdays

Apr 8
Diesel Engine Drivers for Fire Pumps

with NFPA 20. This article is intended to assist contractors in understanding what the procedures need to be in order to test fire pumps correctly under the 2014 edition of NFPA 25 where the relief valve discharge is returned back to the suction side of the pump. The change that was made to NFPA 25 was in two sections as follows:

“8.3.1.1 A non-flow test shall be conducted for diesel engine-driven fire pumps without recirculating water back to the pump suction . . .”

“8.3.1.2 A non-flow test shall be conducted for electric motor-driven fire pumps without recirculating water back to the pump suction . . .”

The rest of each of these sentences goes on to talk about the frequency of the test, which will either be weekly or monthly or in accordance with some other approved schedule. The purpose of this article is to get into the procedure for the test, not the frequency, so we are just focusing on the first part of each section. The key words that have been inserted for both diesel engine driven and electric motor driven fire pumps is, “without recirculating water back to the pump suction.” This new language will require that you run the weekly or monthly churn test without the relief valve operating, which is going to force the pump to overpressurize the fire protection system.

Exposing the components of a fire protection system to too much pressure is a problem. Therefore, the safest way to run this test will be to close the discharge control valve prior to starting the pump (assuming that the pressure relief valve is connected to the discharge piping between the discharge flange of the pump and the discharge control valve). Once this valve is closed, it could be argued that the Impairment Procedures of Chapter 15 of NFPA 25 are required to be followed. These procedures are important and require some very specific actions to take place. While they are not difficult, they do take additional time and effort that will have to be taken into account in estimating what it will cost to perform the weekly or monthly tests.

There are some people that will argue that the Impairment Procedures of Chapter 15 do not need to be followed when the discharge control valve is closed as long as the pump room is staffed with “qualified personnel”. The argument stems from the language in section 4.4 of NFPA 25, which states that water supplies are required to remain service during testing unless “under attendance by qualified personnel or unless impairment procedures in Chapter 15 are followed.” This section does not really say who these “qualified personnel” are or what they need to be “qualified” to do, but the intent here is to have a person who can be contacted quickly in case there is a fire in the building during the test so that they can open up the control valve and get water to the fire. In this case, the qualification is really that they know how to open a valve (the right valve). A more critical point would be that there is some established way to contact this person in a noisy pump room during the test so that they know that a fire is occurring in the building.

The reason that the point is arguable about whether the Impairment Procedures are required is that while the committee made changes to section 4.4 to try and say that having qualified people gets you out of the need to perform the Impairment Procedures, they did not make any change to section 13.3.1.2, which states, “When a normally open valve is closed, the procedures established in Chapter 15 shall be followed.” There is no exception in this statement for a constantly attended pump room. Therefore, the more stringent requirement of section 13.3.1.2 appears to override the allowances in section 4.4. This is certainly something that the committee will need to address in the future.

After closing the discharge control valve, and following the Impairment Procedures (if required), the person performing the churn test then will need to shut down the relief valve. Each type of relief valve is different, but relief valve arrangements generally do not have shut off valves on them, so the relief valve will need to be shut down by adjusting the valve and forcing it closed under all pressure conditions.

Once the relief valve has been shut down, the pump can be started for the churn test and run for the period of time required for the test (10 minutes for electric motor driven pumps and 30 minutes for diesel driven pumps). During this test, the fire pump will be producing a significant amount of discharge pressure. Hopefully, the discharge pipe and components, including the sensing line and components, have been selected to be appropriate for this increased pressure.

After the pump has run for its minimum time, and the appropriate data recorded, the test can be terminated and the relief valve can be reset to open at the correct pressure. Once the relief valve is reset properly, the discharge control valve can be opened. If the Impairment Procedures were followed when the pump was shut down, the procedures need to be finished once the pump is returned to service.

The final activity that needs to happen is a main drain test. Section 13.3.1.2.1 of NFPA 25 requires that whenever a valve has been closed and re-opened, a main drain test needs to be performed to make sure that the valve has in fact opened. Since the discharge control valve was shut to run the churn test, when the discharge valve is opened, a main drain test has to be conducted in order to meet section 13.3.1.2.1 of NFPA 25.

As you can see, a great deal more work needs to be done both before and after running a churn test on a fire pump where the relief valve discharge has been piped back to the suction side of the pump. This means that any situation where the churn test was set to run on a weekly timer has to be changed. Allowing the pump to start from a weekly timer to run this test will allow the water to recirculate through the pump from the pressure relief valve, which will violate sections 8.3.1.1 and 8.3.1.2 of the 2014 edition of NFPA 25. Any fire pump arranged in such a manner to recirculate water from a relief valve through the pump will have to be disconnected from any start timers and will need to be tested manually in order to comply with NFPA 25.

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