Technical Bulletin 63

Peak Demand Compression System

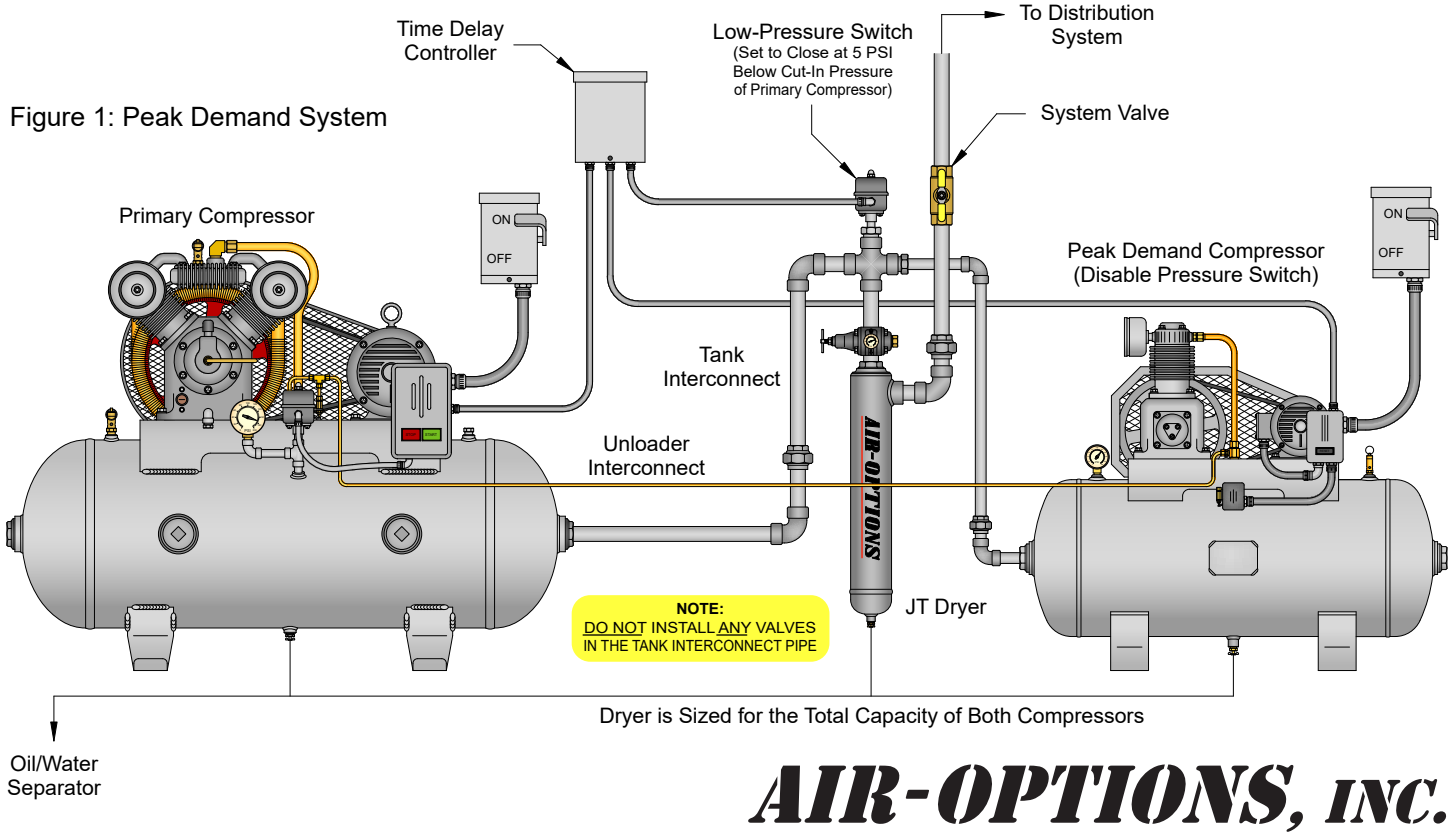
by Brian S. Elliott

It is not at all uncommon to encounter dual compressor systems that are set up to operate in a peak demand configuration. Typically, these systems are configured because the company outgrew its compressor, purchased a larger unit, and decided to set up the old unit to turn on when the system is overloaded. Usually, the compressors are plumbed together and the pressure switch on the peak demand unit is set 5 PSI lower than the primary unit. The idea is that if the system pressure drops 5 PSI below the cut-in pressure of the primary compressor, the peak demand unit will start. Similarly, as the system pressure approaches the cut-out pressure, the peak demand unit turns off 5 PSI before the primary compressor. On the surface, this seems like a pretty good way to utilize the old compressor and boost the new unit. However, in practice, there are a couple of significant drawbacks to this type of arrangement.

The first drawback is the need for a peak demand system in the first place. It is extremely uncommon to encounter a compressed air application that actually benefits from a peak demand system. Additionally, the overall complexity and added maintenance are rarely justifiable. In most cases, a peak demand system is configured because a replacement compressor was selected by price and is simply too small for the application. In those cases where a compressor is added to increase capacity, it is far better to configure the units to operate in parallel. For more information on this configuration, refer to the technical bulletin num. 41, titled, “Parallel Compressor Configurations”. Similarly, many peak demand systems are improperly configured when the company really wants to place the old unit in a backup role. For more information on setting up a back-up system, refer to the technical bulletin num. 56, titled, “Backup Air Compression Systems”.

The second drawback to the system described above is that it really doesn’t provide any meaningful capacity to the primary compressor. In most cases, by the time the primary compressor drops below a pressure that will activate the peak demand unit, it has already been running for an excessive amount of time. This repeated situa-

Figure 1: Peak Demand System



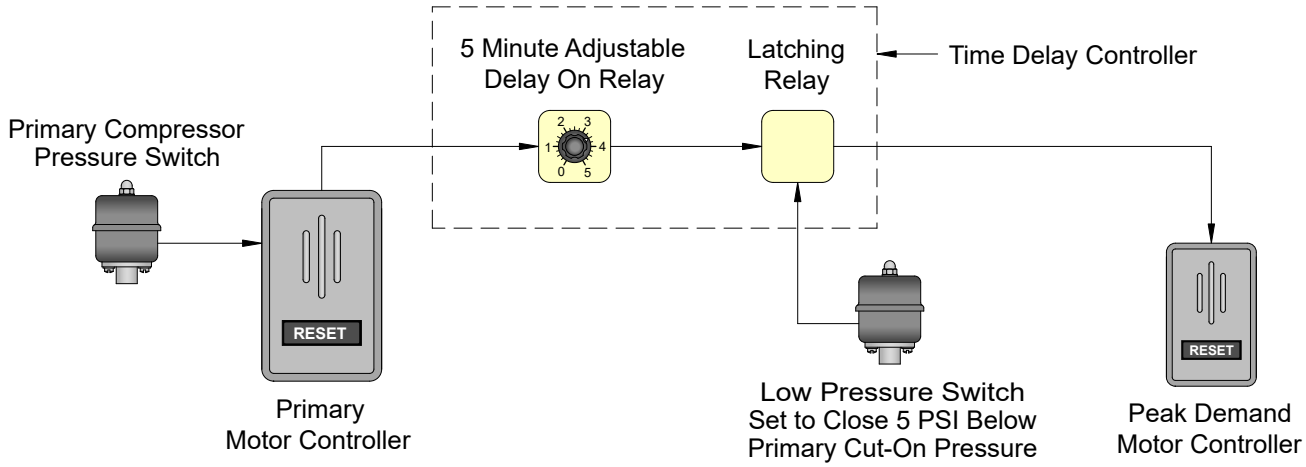
has the effect of severely overheating the pump, which in turn dramatically shortens the life of the equipment. To correct this situation, any peak demand system using reciprocating compressors should be set up with a time delay controller.

A time delay controller is intended to turn on the peak demand compressor if the primary unit has run for a longer time than usual. If, for instance, the normal cycle time of the primary unit is 2 minutes, then the time delay controller may be set for a three minute interval. On the rare occasions when the primary compressor exceeds a three-minute run time, the controller turns on the peak demand unit. At the upper pressure (cut-out), both units turn off. Using a time delay to control the peak demand unit will allow the primary unit to operate within acceptable parameters and substantially reduce the possibility of overheating.

Of course, there is always the possibility that a pressure drop will occur within the time delay interval. Because of this eventuality, peak demand systems are usually equipped with a low-pressure switch. However, it should be noted that if the low-pressure switch routinely activates the peak demand unit, it's probably an indication that the overall system is undersized for the application.

The illustration on the previous page shows how a peak demand system should be configured. The primary compressor operates with its original pressure switch. The pressure switch on the peak demand compressor is disabled, as this unit is controlled by the time delay controller. The low-pressure switch is centrally mounted and communicates with the time delay controller.

The illustration below shows an electrical block diagram for a peak demand system. The time delay controller is triggered when the primary compressor turns on. After the time delay interval is reached, the latching relay closes and starts the peak demand unit. Additionally, the low-pressure switch also communicates directly to the latching relay. When the primary unit turns off, the power to the time delay controller is cut, which in turn cuts power to the peak demand unit. With this arrangement, the peak demand unit can't operate unless the primary compressor is running.



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