DON'T JUST MAKE AIR...STORE IT!

By David Andrews

Planning your compressor system would be so much easier if demand was constant. Simple compressor setup. Straightforward piping.

But most operations aren't smooth and steady. There are fluctuations in demand. And in some operations, there are short processes which have a big impact on total system air needs. This ebb and flow can cause system challenges with fluctuating compressed air pressure. When a system is faced with ongoing significant pressure changes, it can lead to:

- Wear and fatigue on compressors, air treatment and equipment
- Inconsistent air quality
- Reduced product quality
- High operational costs – driven by wasted energy

Most plant air systems have sufficient compressed air capacity. The problem is managing the efficient distribution of this capacity to where it is needed.

Let's imagine you have a production line with one process which periodically uses 50 cubic feet of air for 5 seconds at a time. Converting this demand to CFM we have:

50 cubic feet/5 seconds x 60 seconds/minute = 600 CFM

600CFM is the equivalent of a typical 125 horsepower compressor. While having a sizable compressor ready to meet this demand is one option, there are other means to achieve your air needs which can significantly increase overall system efficiency.

SATISFYING DEMAND FROM STORAGE

In our peak usage example above, the demand could be met by releasing 50 cubic feet of air from storage in the 5 second span, then replenishing storage during the off-peak times. If the time between surges is 2 minutes, this would require the equivalent of a 7.5 hp compressor (versus 125hp) representing the potential for significant energy savings as well as a much more efficient overall system.

Figure 1 shows a graphical representation of the ebbs and flows of our example system. While the solid black line represents the average system demand, the blue and red shaded areas show the real-time demand. During the times when actual system demand is below the system capacity, storage is replenished. During peak events, shown in red, system storage is used to satisfy these temporary surges.

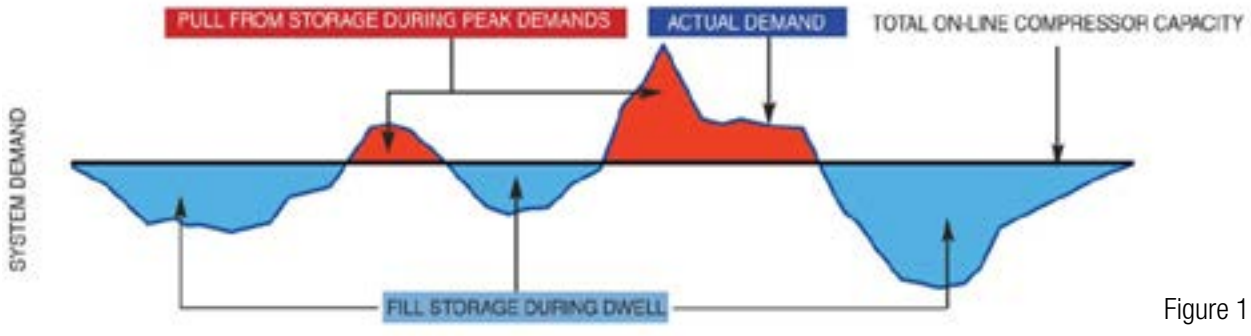

Figure 1

STORAGE VS. USEFUL STORAGE

System storage, which we usually consider to be a pressure vessel or tank, in and of itself provides limited value. If the pressure entering and exiting storage are equal, a quiet zone will be created. Volume has been stored, but there is no useful energy stored. As air leaves the storage tank, the remaining volume in the tank decreases and air pressure drops. Efficient application of air relies not just on the volume of air, but also a minimum efficient pressure. While our storage may provide the volume of air needed, the subsequent pressure drop creates challenges.

Adding a flow pressure controller creates a source of stored energy in the system. The flow pressure controller automatically adjusts to stabilize the pressure exiting storage. Adding this controller to the system helps ensure the proper balance of flow and pressure, which stabilizes upstream processes and improves overall system performance while optimizing energy efficiency.

PLANNING FOR SUCCESS

A thorough review of your complete compressed air system – both supply and demand-side – is the biggest pillar for success. Conducting a compressed air audit can help identify all the unique parameters of your facility and provide an opportunity to design the system to most effectively satisfy your compressed air needs.

The Compressed Air Challenge provides a few keys to remember in assessing system demand:

- Identify those (air) uses which are relatively steady and, therefore, require little in the way of control.
- More important, identify those significant uses that are intermittent. The average flow required over an hour can be substantially less than the peak flow over a few seconds or minutes.
- Arrange secondary storage close to the point of high intermittent use to meet the peak demand without exceeding the average flow in the main distribution piping.

Best Practices for Compressed Air Systems, The Compressed Air Challenge,® Inc.

While the complexities of piping and storage volume are beyond the scope of this document, your local compressed air system expert can help with the system design to meet your facility needs. And with the right system design, you can maximize the efficiency of all your production assets.