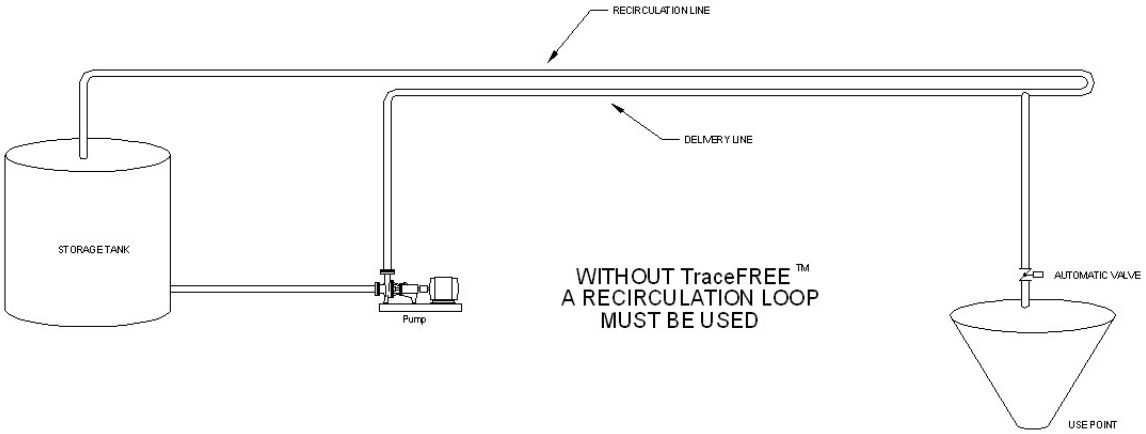
Impedance Heating System Application

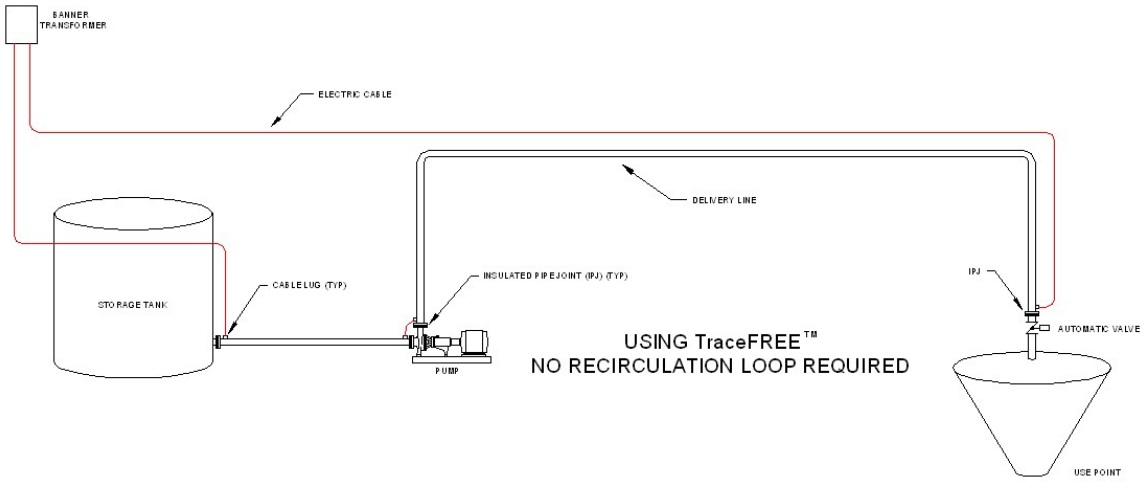
Over the last several newsletters, we have addressed a variety of topics on many different aspects of an impedance system. We have seen how it works, examined the different components of a system, and looked at the maintenance requirements. Now, we will look at a practical application of an impedance system, and the benefits of impedance heating over other methods.

Several years ago, a food manufacturer was planning to expand their business. The overall scope of the expansion included increasing production, and adding a new product line. The key ingredient extensively used at the plant was a type of shortening. This shortening had the unfortunate properties of being solid below 120°F and crystallizing at temperatures above 140°F. The plant had always used heat trace to maintain the shortening pipelines.

While heat trace was able to maintain the product as it flowed to the use point it has short comings. If for any reason the shortening had to be left in the pipe the heat trace would cook the shortening. This resulted because heat trace focuses all of the heat at localized points on the pipe. This causes pockets of high temperature along the pipe at the points in contact with the heat trace. The expectation is that the heat will dissipate and be maintained at approximately the temperature desired. If left in the pipe, the shortening at the hot spots would exceed a temperature of 140F, and crystallize. In order to stop this, the plant had been forced to make loops of piping, with a continuous flow of the shortening through the loop even when not in production. The plant now had to install twice the pipe and use significantly more energy to maintain the material flow. Even with these precautions, the operators would lose material in the short drop legs at the use point.

When it came time for the expansion, the plant leadership decided to try something new. Instead of heat trace, they decided to design in impedance pipe heating systems. Initially, the plant personnel were concerned about the use of impedance. The thought of applying an AC voltage directly to the pipe created fears of electrocutions and interference with other plant machines. As they better understood how impedance worked, and realized that it would not present a risk to personnel or equipment, they were able to accept the favorable benefits provided. Unlike heat trace, an impedance system uses the wall of the pipe as its own heating element. As a result, the heat applied to the pipe is evenly distributed across the entire length eliminating hot spots and the concerns about crystallization. The possibilities and improvements began to be clearer.





Once the plant engineers realized that an impedance system would not overheat the shortening, they also realized they would not have to put in a continuous recirculation loop. By switching to impedance, they were able to cut the quantity of piping in half. This savings alone more than paid for the cost of the impedance systems. On the older heat traced lines, the production personnel had been in the habit of scraping the first batch of product each day. They did this because the heat trace would crystallize some of the shortening in the drop legs, and the initial products at the beginning of the day would not meet quality standards. On the new impedance heated lines, the shortening was not damaged during the night, and the initial product of the new day met specifications and did not have to be scrapped thus reducing costs and improving profitability.

When it comes to plant expansions and renovations, though an integral part of the production system, the heating requirements for pipelines are generally a low priority item. They certainly were at this food plant. In this case, however, the decision to switch from heat trace to impedance heating had a dramatic effect on the scope of the project, and resulted in savings on the installations costs, improved quality and reduced scrape during subsequent operations.

All forms of pipe heating have their uses, whether it is heat trace, steam trace, or impedance. A little extra time spent looking at your processes, and seeing which system best meets your needs, can have a huge impact on the quality, cost and processing of your products.

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