Pq: Pinch is all about using heating sources in the proper location.

Are you getting the most from your exchange?

Use a pinch study to gain better understanding of your heating and cooling sources

Heat recovery is vital to good plant efficiency, but rarely tackled. The reason is simple. If your system doesn't have the proper configuration to efficiently recover heat, then operationally all you can do is clean [what does clean mean?]what you have. But, chances are your feeds and products have varied from the original design. Also, the design was probably created when energy prices were low. If you've pushed your unit and are running against cooling or heating limits, it's time to sit down and rethink your heat integration.

Take a survey of all the streams on your unit before they're either heated or cooled. With these data, perform a pinch analysis of the entire unit. Pinch Technology isn't that difficult and software is available to make the analysis easier. However, you have to purchase and learn the software as well as become a pinch expert to really get full value. Unless you're planning to go into this line of work, it may be easier to send the study to a company that can do the analysis for you. But how do you justify the expense when you don't know if there will be a positive result?

Before spending the money, do a simplified pinch study at your desk. Pinch is all about using heating sources in the proper location. List all the streams that need to be heated on your unit in one column of a worksheet and then sort them by the final temperature they need to reach. In a different column, list all the streams that need to be cooled, sorting them by initial temperature from lowest to highest. Streams that need to be cooled include anything that exchanges with cooling water, fin fan, or is exhausted to air at elevated temperatures, like flue gas or vent steam.

In a third column, list available utility heat, including various steam pressures, fired heating, and cost. Using an exchanger simulation program, like HYSYS or PRO II, get your average heat capacity over the range needed to heat or cool your streams. Using just the worksheet with the rates, heat capacities and temperatures, configure your current heating system. This helps check to see if you have the correct information.

Next, work on redesign. Start heating your most important streams, using available streams that need to be cooled. For a normal shell-and-tube exchanger, a 20ºF approach is a reasonable assumption. If the stream being cooled is large enough, consider a more elaborate set of exchangers and use a 15ºF or 10ºF approach. If there are a lot of different choices, start making logical decisions based on plant layout, current exchange medium, or what does the job simplest. Using a spreadsheet for the task is simpler and allows you to better visualize what needs to be done.

Take into account that some streams need to be cooled to storage temperature and others require only a set temperature drop. Sometimes you may need a stream to provide heat at a high temperature and then at a cooler temperature. Just split the stream by temperature, making sure to interlock the hotter stream's outlet temperature after the hot exchange to the inlet of the cooler stream. Try not to use a very hot stream to do low temperature heating. Don't forget to use waste heat streams.

Once you have heated your stream as much as you can with process streams, finish the job with utility streams. Remember it may be possible to put a low-cost utility

stream in the middle of your system instead of a higher cost utility stream at the upper end.

Although your worksheet may need to be changed several times, it's much easier for a novice programmer to switch a few cells on a spreadsheet then to redo connections in a simulation program. Once you have the worksheet completed, calculate potential savings. If it looks like it may be worthwhile to go with a design change, then simulate your new design to verify your calculations.

This method isn't foolproof as you may miss a big opportunity, but if you can find a better cost effective design, you can be assured that it wouldn't be a waste of money to start a heat integration study project. This may take some thinking, but working with a spreadsheet gives you a better understanding of your heating and cooling sources and saves a lot of time in running simulation models.

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