Pinch Technology Second Generation

Analysis with crisscross optimisation prior to design

Design with loop optimisation for minimum area and minimum cost

Example Case 11

Industrial case – Retrofit Carpet manufacturing plant

Author : Dr. Daniel Declercq

daniel.declercq@pinchco.com

Case 11 – Industrial case – Retrofit Carpet manufacturing plant

Case 11 refers to the retrofit of a Carpet manufacturing plant as a practical application of analysis with crisscross optimisation in a small industrial process.

The process consists of a dyeing line with pre-washing, dyeing, steaming, multiple washing and a dryer kiln, and a coating line with pre-coating, fixing, coating and a final drying tunnel. The dyeing line needs high volumes of water, the drying processes large volumes of air.

The plant utilisation is around 2500 h/year.

A classic pinch analysis shows a Grand Composite as in Fig. 11.1 with a pinch at the low end of the temperature scale. The grid diagram is shown in Fig. 11.3. A pinch design starting at the low end requires HEX connections air-to-air, air-to-water and water–to-water. In view of plant size, low utilisation and complexity of the HEN no economic measures could be initiated.

Analysis with crisscross optimisation leads to a Grand Composite showing a pinch at the high end of the temperature scale instead of at the low end. Crisscrossing ingoing air streams enables reduction of the surface area required as shown in Fig. 11.2. The corresponding grid diagram is shown in Fig. 11.4. A design starting at the high end suggests only limited interaction between air and water streams and enables recovery of 80% of the maximum potential with a limited number of economic attractive measures.

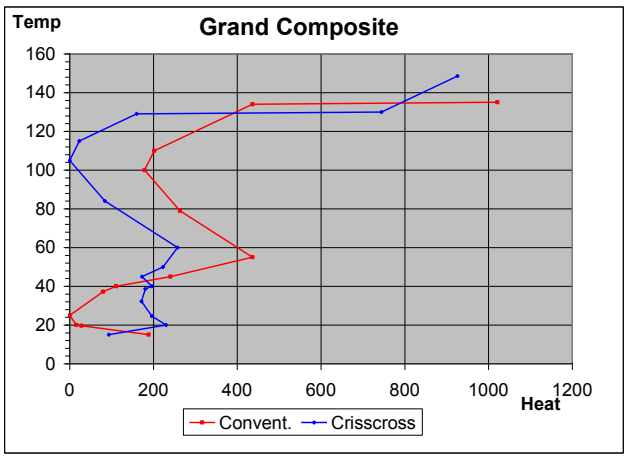

Fig. 11.1

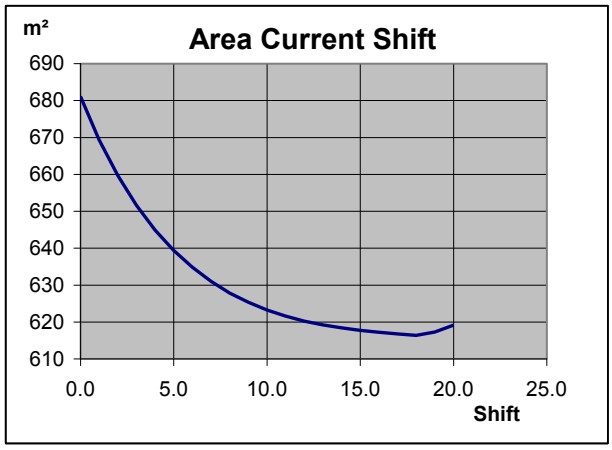

Fig. 11.2

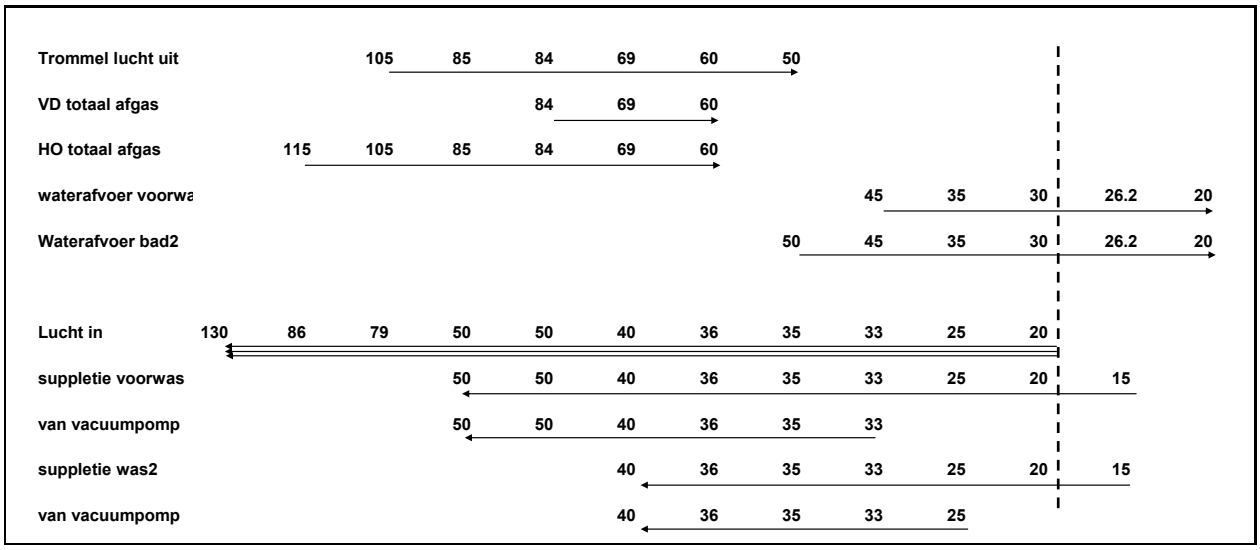

Fig. 11.3

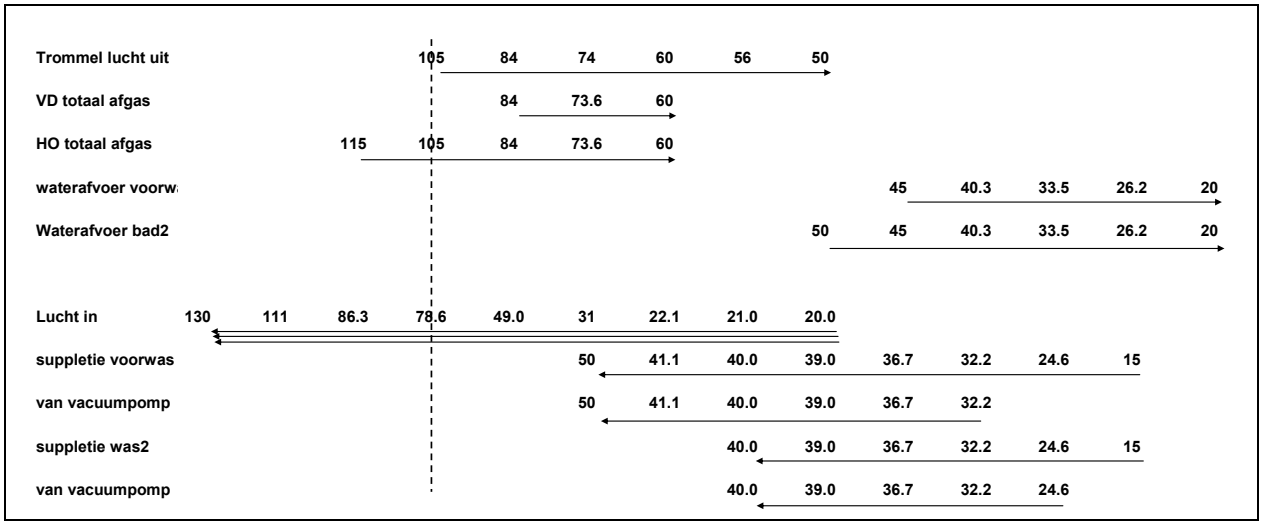

Fig. 11.4