



RACHP Engineering Technicians Section Fundamentals and Theory Series F3 (revised August 2023)

Fault Diagnosis Using a P-h Chart (2)

This second in the series of how P-h charts can be put to everyday use to diagnose faults and help improve the efficiency of installed refrigeration and air conditioning systems looks at loss of refrigerant and compressor efficiency.

Reading and interpreting a pressure-enthalpy chart (also referred to as P-h chart or diagram and as a Mollier diagram) is a key skill for diagnosing problems and maximising efficiency. It is a key element behind the F gas training. Efficiency is not just about saving the customer running costs—if a system is not working efficiently then it may not achieve its required output, it will use more power and is likely to fail prematurely.

1. Loss of refrigerant

Early leak detection will help to reduce the volume of refrigerant lost and therefore maintain system efficiency, reduce power consumption and increase the life of the compressor. Fig. 1 shows a P-h plot for a system working properly – blue. Fig. 2 shows that for a system which is short of refrigerant – green. The reduced pressures and temperatures in condenser and evaporator, the high superheat at compressor inlet and discharge can all be readily observed. The incomplete condensing will also be evident if the system has a liquid line sight glass. Regular monitoring of these parameters and comparison with historical data by a properly trained and qualified engineer can constitute the indirect leak detection method referred to in F gas regulations.

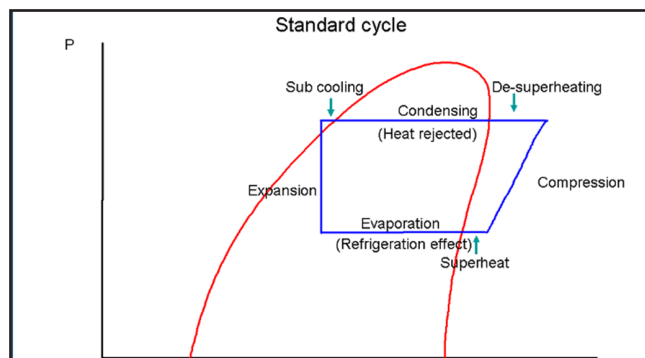


Figure 1

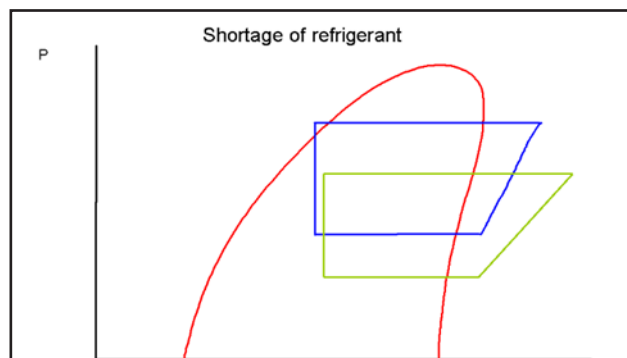


Figure 2

2. Inefficient compressor

Fig 3 shows a P-h chart plot for a system with a compressor that is not running properly. The discharge pressure is low, the suction pressure is high, the discharge superheat is high and there is vapour in the liquid line. The system is unlikely to satisfy the load requirement or it is running for longer periods to do so. If the compressor is hermetic then replacement is the most likely remedy. For the semi-hermetic and open drive compressors a standard pump down test would confirm the need for further investigations.

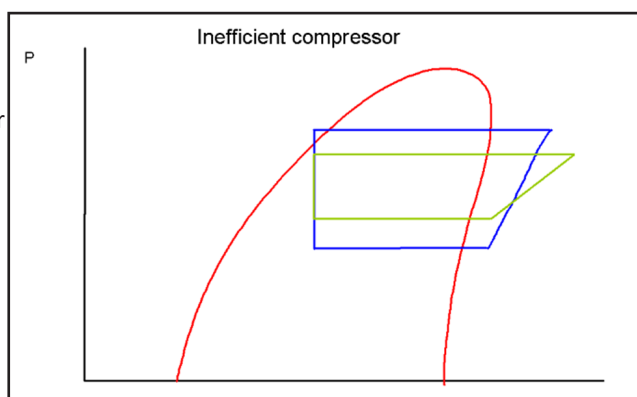


Figure 3

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