A universal floating head system

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The paper describes a refrigeration system design which maintains maximum efficiency at all ambient temperatures and which can be used with any refrigerant (including carbon dioxide) without exceeding acceptable pressures. The system is particularly suited to large scale implementation, such as supermarkets and food stores.
The system automatically adapts itself to changing ambient temperatures and allows the head pressure to float down to the lowest levels needed to operate the thermal expansion valves in the evaporators. At low ambient temperatures the system is a single stage system, but as the ambient temperature rises a coupled second stage seamlessly switches in to maintain the highest possible overall efficiency.
The system components are all standard items and maintainability and reliability are therefore no worse than existing refrigeration systems.
Cycle analyses are used to show that when the system is used with existing refrigerants such as R22 or R404A, the annualised overall energy efficiency for any climatic zone is increased by at least 20%. For cold climates the improvement in overall efficiency can be as high as 50%. When the system is used with high pressure high efficiency refrigerants such as R410A or carbon dioxide, then the annualised energy efficiency in temperate climates can be more than 30% better than the best existing plant.
The benefits of this new system are reduced climatic impact through lower energy consumption and through elimination of artificial refrigerants through the use of carbon dioxide as a working fluid.