RD&T Case Study

Payback and energy use of rapid roll cold store doors

Company: Union Industries

Background

For many years, Union Industries have produced high speed doors for factories, warehouses and cold storage and distribution facilities. For warmer applications such as factory entrances a spreadsheet-based mathematical model had been used to illustrate payback times to potential customers. When the new cold temperature Eiger Door™ was introduced, Sales Director Alan Hirst asked RD&T's Tim Brown to develop a similar payback model for application of the door to openings between ambient and cold store environments down to -30°C.

The model

The aim of the model is to assess the payback time which can be achieved on the higher capital cost of a rapid roll Eiger Door compared to a traditional sliding door as a result of reduced energy and maintenance costs.

For a particular application, the user of the model enters the air temperature and humidity on either side of the door, door dimensions, opening schedule, speed of opening, dwell time and speed of closing. The model calculates infiltration heat loads (sensible and latent) when the door is open based on a method developed by Gosney and Olama[1] (1975), and assesses condensation and freezing of moisture on the store evaporator(s) and the effect on defrost energy requirements. Transmission and leakage heat loads when the doors are closed are added (particularly important as the Eiger Door uses a rolling double skin inside which warm de-humidified air is circulated to ensure trouble-free operation). The model converts the total heat load on the refrigeration plant into energy consumption using a temperature based relationship for Coefficient of Performance (COP), and adds direct energy consumptions of door motors and the Eiger de-humidifiers. The costs of this energy, added to maintenance costs, are then compared to determine how quickly the additional capital cost of the Eiger Door will be recovered.

Results

Payback has been assessed on a range of applications based on data provided by Union Industries' customers. As would be expected, payback varies with store conditions and door size. It is also strongly reliant on the benefits gained from rapid activation and the considerably lower maintenance costs for the Eiger Door.

1. Gosney, W.B. and Olama, H.A.L. (1975), 'Heat and enthalpy gains through cold room doorways', Proc. Inst. of Refrig., 72, pp31-41.

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