AIR-CONDITIONING IN INDIA

Problems of Railway Passenger Cars

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Air conditioning for railway passenger care has for a long time intrigued both engineers and the travelling public. The needs of this field have been well known all over the world, but the first practical and commercial installation was applied in 1929 to a standard coach of the Baltimore and Ohio Railroad in America. The success of this trial led to a modified and improved system being installed in a diner, the "Martha Washington" in regular service from April 1930. This was not the first air-cooled car in the world since there are records of a practice in Egypt and India of cooling cars by hanging wet cloths or matting over the windows and roofs, thus reducing the temperature by evaporative cooling.

Beginnings in India

In India, it was recognised that air conditioning of railway passenger equipment was inevitable, and a few years before the war, air conditioned coaches were running on many railways, including the B.B. & C.I., the G.I.P. and the N.W.R. As soon as engineers started to tackle this problem in India, the number and scope of the factors involved in the choice of the type of installation became immediately apparent. Distances are great; halts at stations are long; climatic conditions vary tremendously in a run from, say, the dry plains of the Punjab to the humid ports of Bombay and Calcutta.

In solving the difficulties, consideration had to be given to the various methods possible. There are three general systems available: (a) compressor system of mechanical refrigeration; (b) ice system, where ice forms the cooling medium, and (c) combination of mechanical refrigeration and ice system.

Each of these systems has a further division into whether the air conditioning sould be a central blower plant for the whole coach or individual air blower equipment for each separate compartment. Each railway needs to consider the advantages and disadvantages of the various arrangements with due regard to the operational conditions, type of traffic, and areas through which the service runs. Generally speaking, the ice system has advantages for individual compartments on short runs; mechanical refrigeration is more advantageous for single purpose coaches over long distances; and a combination of the two for general purpose lines.

The engineer has to decide the method of refrigerating suitable to his problem; the arrangement of units; the method of supplying energy; and the most efficient means of insulating the coaches. But these questions can only be answered by experience and trial installations, such as have already been made in India and have already advanced the available knowledge considerably. In designing the installations, figures for heat gains and power consumption depend on many variable factors such as, the effect of solar radiation and the air velocities over the coach, but there are compensations that can only be determined by experiment.

Post-War Problem.

The finest calculations in the world are useless without the practical application. The pooling by all Indian railways of their experiences during the last seven to eight years will prove invaluable in the design of post-war air conditioned coach construction. The writer was engaged on the original tests made for the Baltimore and Ohio Railroad in 1929, and it took one year of preparatory experiments to determine the original requirements. No theoretical calculations can ever take the place of actual test loads. Indian railways now have experiences of all types of installations; mechanical refrigeration, ice system, central plants, separate compartment equipment, with all their variations of drive and arrangement, and, the future travelling public will gain the benefit of this practical experience in the installations now envisaged.

Those who have travelled on the railways in the hot weather will appreciate the comfort of clean, fresh air, at the right temperature. The railways recognise the importance of this as a means of attracting the travelling public, especially now that air and road transport have improved tremendously both in quality and availability. But the engineers engaged in the design must appreciate that the standard of public demand for comfort and efficiency has increased enormously during the last few years. It is no longer sufficient to provide a compartment cooled like an 'ice-box.' There must be true air conditioning; supply and circulation of cleaned fresh air; provision of adequate air movement; control of temperature of the air; humidity control; and, where possible, graduation of "shock" from inside to outside conditions and vice versa—this latter is normally only practical with corridor type coaches. The public also demand that the installation be practically 'fool-proof' and not subject to frequent irritating breakdowns.

Fresh Air Supply

One of the greatest advantages of a system of air conditioning is the provision of clean fresh air for the passengers. The opening of railway windows is usually accompanied by a swirl of cinders, soot, dust and smoke. The basis of air conditioning must be to have all windows closed and locked and the ventilating air must be drawn through a cleaning device excluding dust and dirt and providing equal distribution irrespective of wind pressures. The amount of air circulating varies somewhat with the particular type of coach but special allowances must be made for smokers and in dining cars. Care should also be taken to prevent unpleasant odours passing from one compartment to another.

Control of temperature and humidity by the refrigerating medium—cold water from ice passing through coils or direct expansion dry coils—must be interdependent. Control of temperature alone is insufficient as low temperatures to and relatively high humidities give "ice-box" conditions that make you shiver. Practical requirements limit to some extent the degree of control and the conditions that can be maintained, but considerable improvement of present arrangements could be made after due consideration has been given to the mass of experimental and practical data available.

However, it is one thing to apply such a system to a coach, but it is an entirely different matter to train an organisation, scattered over the country, in operation and maintenance so that the equipment will function continuously and efficiently. The problem is not alone that of the railways but involves the ventilating and refrigerating engineers of the country, by whose efforts simple and reliable equipment can be developed. Preference will be given to those systems which employ the minimum number of working parts, the lowest operating expenses and the minimum of space requirements.