Willis Haviland Carrier

Father of Air Conditioning

VOLUME-1
Willis H Carrier: The Man and His Message

1.10 Carrier Corporation Leads an Industry of World Importance -Air Conditioning, 1950-1975

CARRIER, THE MAN AND HIS MESSAGE

CHAPTER TEN

Carrier an Industry of World Importance

In the early enthusiasm of learning about air con - ditioning, the young engineers in Carrier revelled in the possibilities that their imagination produced. Cities would be built with internal environment given by manufactured weather. Buildings could be windowless if necessary. In the late twenties all this was heady stuff but most of it was to be equalled by fact in the decades of the future.

It is relevant to take decade by decade to watch the surge of air conditioning as an industry and the way in which it became known throughout the world. In 1952 the sales of Carrier Corporation exceeded the 100 million dollar mark, and in the next decade it was to increase to over 266 million dollars. It was a period when scale of manufacture and size of organisational structure were the keynotes of the industrial scene. There were predators around looking for hidden or unused assets. The companies, who considered conserving their resources was a foremost responsibility to their shareholders, were liable to market raids. Carrier Corporation were not caught in this squeeze because they had been lead financially into the mainstream of expansion by internal growth and had cemented their position to supply the maximum services to the industries they served by grouping together in mutually merged resources. Thus on March 1st, 1955, Appli - cated Gas Equipment Inc. and on July 31st, 1957, Elliott Company of Jeanette, Pennsylvania merged into Carrier Corporation. By 1961, the sales of Carrier Corporation had exceeded 266 million

dollars, which had increased to more than 324 million dollars by 1964. In this year, the first centrifugal refrigeration machine developed by Willis H. Carrier in 1922 to make big building air conditioning practical, went on display in the Smithsonian In - stitution. At the same time, a tape was made recording just why Carrier considered this development essential to the future development of the air conditioning industry and just how he managed to overcome all the difficulties that he had to face in order to accomplish his aim. It is a lasting tribute to Carrier's genius of persistence.

The growth of Carrier Corporation's business now pressurized the manufacturing space even with the latest available machinery aids. So in 1965, two building projects totalling 635,000 square feet were added to the Thompson Road complex in Syracuse. The early pioneers of Freylingheusen Avenue may have dreamed dreams of air conditioned cities but they did not have visions of the Carrier works ever encompassing the areas now covered in Syracuse or the vast number of employees whose livelihood depended on this huge endeavour.

Meanwhile, what was happening in other parts of the world to the companies that had started from Carrier's original ideas and who in many cases bore his name. The biggest of these, Carrier Engineering Co. Ltd of London had severed financial links with Carrier Corporation in 1935 but remained tied by technical agreements and sentiment. Many of the subsidiaries started by them in "Empire countries" like Australia, South Africa and India, found the pressures of being consultants, engineers, manufacturers and contractors incompatable with their market and eventually that

part remained manufacturing as in Australia and retained the name Carrier was rightly absorbed into the original parent Carrier Corporation. Territories such as Nigeria where no local company bore the name Carrier, presented little diffi - culty in the transformation that was taking place. A local company could become agent for equipment manufactured by Carrier Corporation. It was obviously the aim that the name Carrier anywhere in the world should reflect the ideas of Willis H. Carrier and the industrial organisation that he had started. In the case of Carrier Engineering Co. Ltd. of London and its major direct subsidiary Société Carrier of France, the requirement to stay as consultants, designers, manu- facturers and contractors had led them to deversify their thermal engineering knowledge into the paint finishing industry with special reference to automobile assembly as a balance to the air conditioning business. They wanted to remain in a specialist market where inventiveness and innovation were most important than price competitiveness. It was a hang-over of the original Carrier days in an industrial climate that was unsuitable. Nevertheless they succeeded in remaining extremely profitable with excellent liquidity. Naturally there were many discuss - ions over the name Carrier and thos discussions were not always as amicable as the individual friendships between the personali- ties concerned might have wished. In fact there was a long period after the Second World War of disagreements between London and Syracuse which undoubtedly prevented a more normal exchange of opinions on mutually vital commercial decisions. The fact that import of U.S. equipment into U.K. at that time was prohi- bitive only added to the lack of understanding on market fulful- ment. The issues came to a head over manufacturing and distri- bution of Carrier equipment in U.K. and the clash of personali -

ties at that time resulted in Carrier Corporation being forced to seek other partners for the work in U.K. and trade there under the name of Carlyle rather than Carrier. Reading some of the telegraphic exchanges that took place at this period epitomizes the way personal dignity (whether true or pseudo) can be almost childishly inconistent and block issues that can only be deemed a kind of commercial suicide. In consequence when Carrier U.K. were repelling boarders, their most natural ally Carrier Corporation had only just recovered from a decade of fiercely fought tangles with their English friends. Successful repulshion of boarders, however, came to an abrupt half in 1970 when Haden Limited, after a bitterly contested opposition, made a cash bid deemed most acceptable by the Pension Fund shareholders and were narrowly successful in a take-over situation. Thus Carrier Engineering Co. Ltd. and Société Carrier S.A. were swallowed up into the resultant large contracting organisation of Haden Carrier Ltd. But, essentially the position has been gained whereby Carrier Corporation was the sole world wide organisation fundamentally continuing the business of Air Conditioning, its manufacture, marketing and distribution originally promoted by Willis H. Carrier'sfirst essays into the business with his company in 1915.

By 1970, the sales of Carrier Corporation were over 550 million dollars and Dempster Brothers Inc. of Knoxville, Tennessee, solid disposal company, Transicold Corporation and the Harding Screw Company had joined the other inter related companies within Carrier Corporation. Elliott compressors in the North sea were pumping natural gas back into Ekofish field to speed oil. Sears Tower, Chicago, in 1973, the world's tallest building was in - stalled with heat-conserving all-electric air conditioning.

So far the industrial effect of the Chief's ideas has been limited in analysis to the growth of the Corporation to which he gave his name. But though in the twenties competition was minimal the popularity on a world scale ensured the consequent growth in competition.

Air Conditioning had originated as Carrier's idea for the solution to a problem of humidity control for industry. The immediate recognition of the economic benefits to Industry ensured its growth in those industries where humidity requirements had previously determined the location, such as cotton spinning, weaving, paper handling, where the hygroscopic nature of the materials was one of the predominant factors in the manufacturing process. As most of such industries served a large proportion of the people in every country (clothes from textiles, books, papers and magazines from paper, cigarettes and cigars from tobacco) the size of such industries was large in every country and formed, therefore, a strong economic base on which Carrier could found his air conditioning business.

However, he early recognised the need to apply air conditioning for human comfort and it was in this field that the greatest growth has taken place. At first, it was places of entertainment that demanded the new facility and gave it most publicity - theatres, cinemas, and restaurants. Some of the publicity was bade, where proprietors over-cooled for effect. Naturally, this growth appealed to competition and at the end of the twenties a number of companies were able to contract for air conditioning application. In some cases, poor design acted as a set back to growth but Carrier continued to set the standard. At this stage, there was a popular idea that air conditioning was

expensive and could only be afforded in expensive places. So the First Class Public Spaces on board ships, the First Class Dining Saloons on trains, the posh restaurants, Casinos, Maharajah's Palaces - the haunts of the wealthy were alone expected to have air conditioning.

Those original air conditioning installations were all purpose-built, one-off designs in heavy construction in the mode of the time. Cooling of water was by huge bandelot coils connected to various types of refrigerating machines. Carrier's centrifugal machine revolutionised the refrigerating plant room, the reduction in space requirements being fantastic but the distribution of water and of air remained bulky and heavy. There were numerous systems evolved to reduce size and weight including the direct distribution of refrigerant (first methyl chloride then freon) to unitary, none of which were finally considered satis - factory. It was Carrier's persistent genius that made the high velocity induction system possible. In office buildings where there had only been the Board Room or at most the top executive offices air conditioned, now the whole building became the target. The change in building construction with its enormous glass areas, the use in urban pollution of noise and dirt, the city use of high rise buildings all over the world, precipitated a huge growth in the Air Conditioning industry.

The self contained unit which had begun life as a luxury in a polished mahogany cabinet for the celebrity was programmed by the demand into a mass produced box, manufactured by a whole range of competitors, that would be installed by the million. Travellers today easily recognise the spread of air conditioning and its importance in the industries of the World as they fly in

an air conditioned limousine, stay in an air conditioned room and carry out their business in air conditioned offices. This in countries like India, South Amercia, Japan, Indonesia, Singapore, Saudi Arabia. Its importance in tropical countries is more quickly understood though it is equally necessary in places of severely low temperatures. Nevertheless perhaps the most recent and gigantic force for the growth and importance of the air conditioning industry has been the precision requirements of miniaturisation - clean air conditions - the elimination of dust particles. This necessity increases with each year of progress in the process of making things smaller - whereas some years back dust was measured in particles that could be seen (5) today it is expected in some special circumstances that dust particles down to .001 are eliminated. Work that can only be executed by use of high powered magnifying glasses makes an entirely new growth pattern. This coupled with the sensitiveness of modern surgical innovation makes it clear that Air Conditioning has a world of growth in the future and in the year of the centenary of Carrier's birth, his idea has a world wide acceptance in every facet of modern life.

But 1973 following the middle east war saw the oil em - bargo dominating the energy situation and making energy conservation a major political/industrial priority. Closely associated with that has been the requirement for research into other means of energy creation - solar - wave power - geothermal - windpower. Carrier Corporation's efforts illustrate the attitude of the air conditioning industry that Carrier created. A new Division has been created to promote conservation of energy in existing buildings and the production of energy from solid waste. Building a house for study will enable concepts for storage heating and

cooling to level energy peaks and the examination for the application of solar power to be carried out under practical conditions. Design studies have been initiated for the inte - gration of various building services including air conditioning in modular ceiling structures for commercial buildings. So the world of tomorrow will have energy as a prime subject. Energy, how to get it and how to use it, has become one of civilisations massive question marks.

Among the many spheres of investigation in the research on heating part of a heat exchanger to 1,100°F with a special coating to show stress areas and so enable a new generation of furnaces to be conceived which may save up to one fifth of the energy required for home heating; so also is the development of air conditioners that use less energy.

On the solar heat angle, evaluation is proceeding on the application of solar heat to the absorption refrigerating machine. While solar engines are envisaged for which the sun's radiation will vaporize refrigerants or other fluids which will power rotating machinery to produce useful energy. The Florida solar demonstration home incorporates new types of solar collectors, a Rankine cycle enginer to turn solar energy into mechanical energy for air conditioning and a weather bureau and data collecting system for computer analysis of operating requirements. It includes solar heating, solar cooling and solar water heating equipment. There are plans to develop solar assisted heat pumps.

The monitoring of weather conditions and equipment operation in cities to determine efficiency relationship - seasonal performance factors, energy efficiency ratio - EER - are

of special concern in connection with heating by heat pump air conditioners - will provide the evidence that major improvements are possible in equipment changes and better system design and application.

The only commercial installation using geothermal energy in the U.S.A. is Pacific Gas and Electric's power plant complex at the Geysers, North of San Francisco, which has three Carrier Elliott turbine generators. There are many locations where usable steam or hot water can be found at 10,000 ft. or less. But steam or hot water may contain solid particles or corrosive chemicals. Carrier must, therefore, study material and blade design to reduce wear. In one experimental project a machine turning at 50,000 rpm whirls blade samples through mixtures of steam and water to test their resistance. Computer studies are necessary to predict particle impingement patterns to improve blade configurations. To recycle energy, Power recovery turbines must also be designed to handle gases containing particles which can cause wear. Abrasive dusts are blown at close to the speed of sound across blade samples and are checked by laser beam for development of better turbines to be used in the production of geothermal energy and for heat recovery in petroleum refining and coal gasification.

The new developments have wide applications. Air compressors are used for producing oxygen for the controlled combustion of coal. There are power recovery turbines referred to above. There are compressors to recycle the gas and refrigeration compressors to strip out heavier elements during recycling. In South Africa there are compressors in a production plant for coal liquefaction, liquid can be used as a feed stock for the

petrochemical production or can be refined to produce gasoline. In Shasta Brazil is the world's first pilot plant for the pro - duction of oil from shale. Axial compressors are used where volumes of air or gas to be compressed are greater than can be handled by centrifugal compressors. So axial compressors are used in enrichment of uranium for the production of nuclear energy.

By 1975 Carrier Corporation had entered the business of supervising designs, construction and operation of plants to convert solid waste into heating, cooling and other kinds of energy. In the year of the centenary of Carrier's birth, 1976, the Carrier Corporation returns showed net sales well over one billion dollars with profit before tax of 66 million dollars. And the challenge continues to be accepted by Carrier in the order of the world's largest refrigerating plant to cool the re- actors of two new nuclear generating plants in Iran.

As already recorded, the centrifugal machine, invented by the Chief in 1922 as the first safe, practical device for cooling large spaces, opened up the comfort air conditioning market. The centenary year was also marked by Carrier Corpora - tion producing its 25,000th centrifugal refrigerating machine for installation in a Fort Pierce, Florida, hospital, operated by Hospital Corporation of America.

If at times there may be confusion in the reader's mind over the word Carrier as to whether it refer to the man, the Corporation that he started or the industry that was created from the development of his painstaking and brilliant research, that

to Columbia University to hear a lecture by Dr. Richard Planck, an internationally famous refrigerating engineer. It was to be his last quest for engineering truth. The "Father of Air Conditioning" died of a heart ailment on Saturday, October 7th, 1950, in the Cornell Medical Center, New York City, just six weeks before his seventy fourth birthday. He was buried in Forest Lawn Cemetary, Buffalo, the memorial service being held at Park Central Presbyterian Church, Syracuse. Survivors included his wife, Mrs. Elizabeth Marsh Wise Carrier and two sons by a previous marriage, Vernon Carrier of New York City and Earl Carrier of Boston.

The industry born out of his idea, fathered by him to manhood was to make all his dreams come true.

No life of genius stops with his death - his ideas live on in the memory of his colleagues - then in the memory of his benefactors - in this case the people of the world through the Industry that Carrier has created.