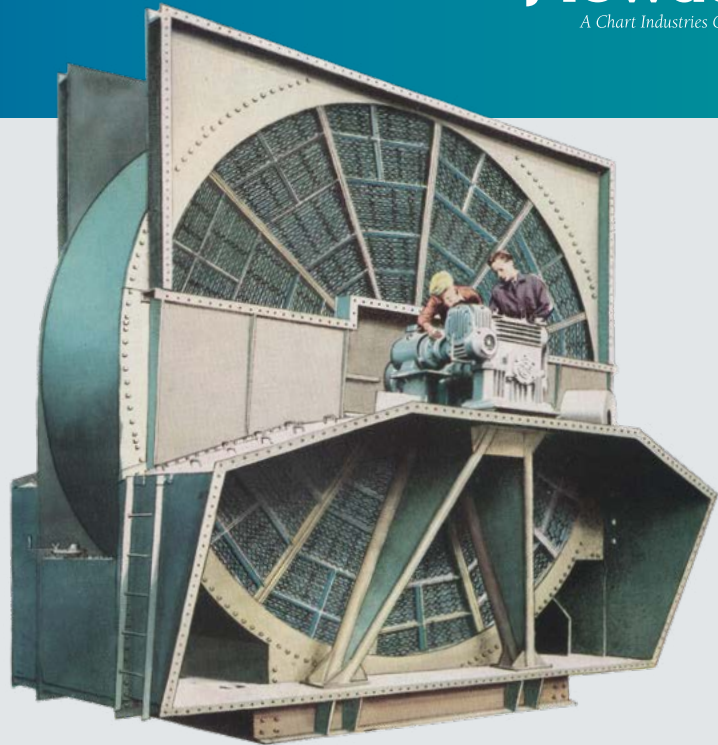




Howden centenary

One hundred years
of Howden's rotary
heater business.



Celebrating the journey from Fredrik Ljungström's idea to Howden's commercialisation and ongoing development

Chasing efficiencies is certainly no modern day phenomena. Industrial production processes have always pushed innovation in this area, and so it has been a consistent theme throughout Howden's history. This year, we celebrate the centenary of our association with the rotary heater. The heater continues to be used extensively within power generation, boiler-based processes, and indeed, anywhere that heat needs to be transferred between gas flows to increase efficiency and reduce the need for additional powered heat.

The inventor was the renowned Swedish engineer, Dr Fredrik Ljungström. Dr Ljungström established himself as an industrial engineering designer alongside his brother and is credited with many innovations, including the condensing steam-turbine locomotive and the rotary heat exchanger.

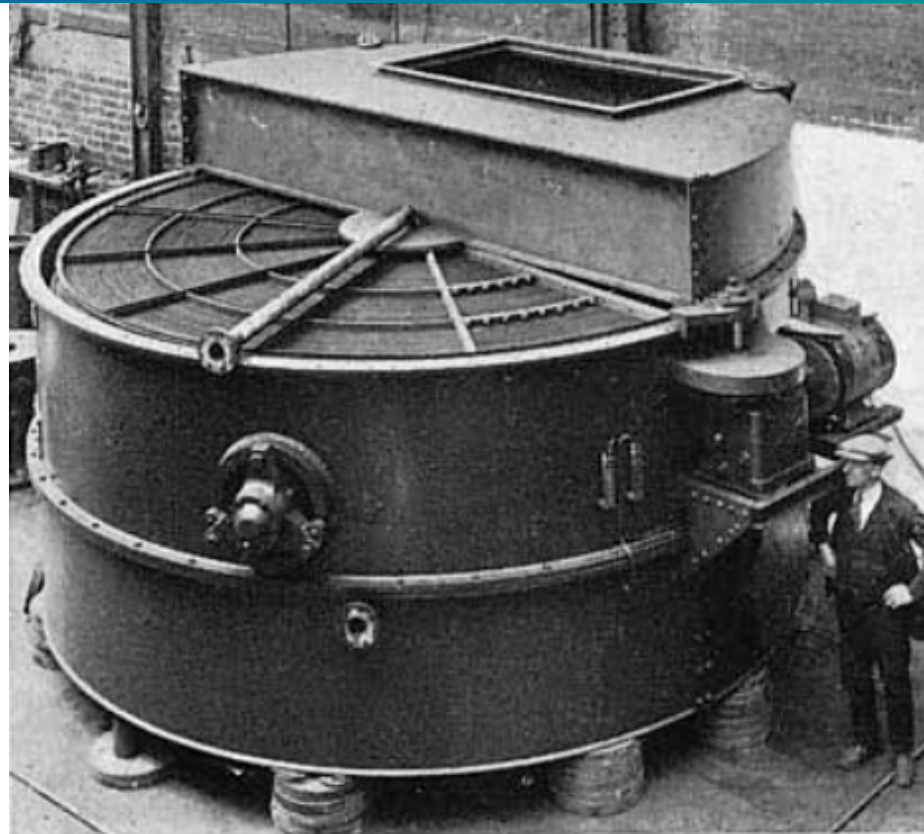
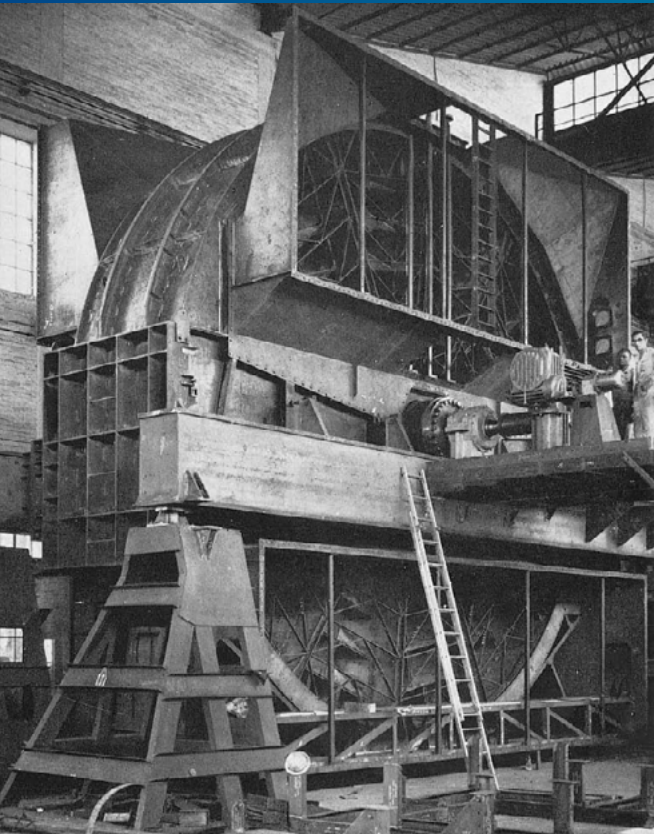
In his lecture to the Institute of Mechanical Engineers, he explained the origins of his design saying, "My idea of the rotor carrying the regenerative material from one side of the heater, where it was heated, to the other side, where the fresh air was entering, was proposed as an improvement of the application [air cooled condenser for a steam locomotive]. The development along air-preheater lines ensued."

In 1921, initial tests on his own company's (AB Ljungströms Angturbin) central-heating boiler confirmed its promise. Shortly after these trials, Crawford and Willie Howden were introduced to the design while on business in Belgium.

Howden's business was built on the substantial marine boiler industry centred in Glasgow, but was expanding to larger onshore power applications. They instantly recognised the potential of the heater for preheating air in these boiler plants and entered into a joint venture agreement with Aktiebolaget Ljungström Ångturbin (ALÅ) to form Howden-Ljungström Preheaters Ltd. in 1923. This JV firstly enabled manufacture and sale throughout the British Empire, and later in 1925, the Air Preheater Company (APC) was founded to supply to the United States. Although the two JV founding companies parted ways in 1931 and Ljungström took full ownership of APC, Howden continued to actively serve the British Empire until the early 1990's when the global heater market opened up.

Further details can be seen in ASME's International Historic Mechanical Engineering Landmark document – 185-Ljungstrom-air-preheater.pdf ([asme.org](https://www.asme.org)).

It was a beneficial partnership from the early stages. Dr. Ljungström saw the output of his design for Howden's market, commenting, "tests on a marine boiler at Howden's in Glasgow showed the remarkable overall efficiency of 88 per cent." He also credited Howden for its dedication in commercialising the invention saying "the air heater's teething troubles nearly killed the child; it was, I believe, largely through the broad-minded and untiring endeavours of Messrs. Howden and Company, when introducing the air heater in Britain, that it was able to thrive."



Howden-Ljungström Preheaters Ltd APH (Howden Group)

After two decades of his invention gaining market acceptance, in 1949, Dr. Ljungström was awarded the James Watt International Medal from the Institute of Mechanical Engineers, noting it “has proved itself the most compact, and, for the space occupied, efficient of air heaters and today is being chosen for the most advanced boilers for steam generation on land and sea.”

This explains another key reason for the success of the design other than high efficiency. Ship-based boiler systems were able to do away with the traditional tubular heat exchangers in favour of a rotary heater requiring, in some cases, less than 30% of the space and having weight savings of approximately 60%. Although land-based power applications have long since been the major market, space remains a valuable commodity aiding reduced capital cost and project complexity.

The basis of design has remained constant since the original, further illustrating the strong match to process needs. However, innovation is continuous at Howden, and multiple stream arrangements and many improvements have been introduced to suit changing customer requirements, applications, fuel types, emissions legislation and efficiency requirements.

The elements, tasked with transferring the heat, have been developed in various profiles and coatings to maximise performance relative to duty conditions. Advanced sealing systems minimise leakage between flow streams, and advanced cleaning systems such as Enerjet™ have been developed to remove fouling. Centre drive systems replaced the old rack and pinion drive method, while fire detection and fire fighting systems increase safety.

Adding to the technical developments, the application has also broadened with the need to increase the efficiency of emission controls systems on combustion boilers. What once heated air prior to the boiler now also reheats gas emitted from FGD equipment in order to achieve sufficient plume buoyancy and prevent ground level concentrations of SO_x. Within steel plants, gas preheaters are used to efficiently heat the gas before the SCR to reduce NO_x emissions.

One hundred years may have passed since the establishment of the Howden-Ljungström Preheaters Ltd. joint venture, but Howden’s commitment to development has ensured that the rotary heater product and technology continues to have a future delivering tangible benefit to operators and the environment.

Find out more about our heater range:

www.chartindustries.com/Products/Air-Preheater
or www.chartindustries.com/Products/Gas-Heater

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