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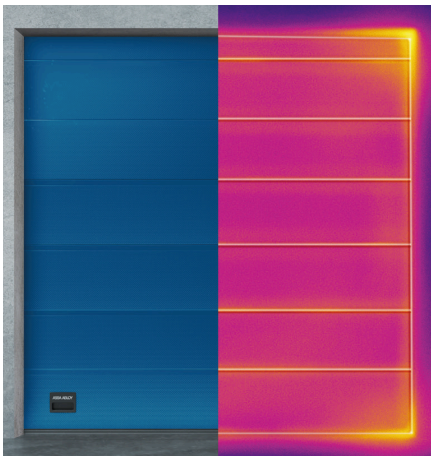
Improving The Thermal insulation of Industrial Doors

In the realm of industrial buildings, reducing energy losses has become a critical concern, leading to a higher demand for increasing the thermal insulation of industrial doors. Through redesign of carefully selected components of the industrial door, the thermal insulation could be increased by 20% while only increasing cost by 1%.



The growing need to reduce energy losses in large industrial buildings has increased the demand for better insulation of industrial doors. Therefore, this project aimed to enhance the thermal insulation of industrial doors without compromising their structural integrity while considering economic and environmental factors. Increasing thermal insulation can be translated to decreasing the U-value, which is the industry standard parameter for measuring thermal insulation. U-value is a measurement of thermal energy flow per unit area and temperature $[W/(m^2K)]$. So the lower the U-value, the better the thermal insulation.

The project resulted in two concepts that, if implemented, would decrease the U-value of the door by almost 20% while only increasing cost by 1%. This improvement would save almost 5% energy in heating per door over a 5 year period, and decrease the environmental impact in manufacturing. This was achieved by breaking thermal bridges through the use of materials with lower thermal conductivity than steel, and by implementing a thermal break through the removal of a strip of steel.

Upon investigating the factors affecting the total U-value, it was found that thermal bridges and the linear thermal conductance played a greater role than expected. Typically, a thermal bridge is the primary factor contributing to increased heat flow. It was also discovered that increasing the length of a thermal break significantly decreases the heat flow. This principle was applied to one of the concepts, maximizing the benefit from the thermal break.

In the field of mechanical engineering with industrial design, this project highlighted the importance of working in a solution-neutral environment to formulate the minimum number of requirements for a problem. It also demonstrated that the most obvious solution might not be the best one, considering we did not simply make the door thicker. Additionally, the project was a lesson in designing seemingly small and unnoticeable changes that had significant impact.