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Demand Controlled Ventilation is an energy-efficient and environmental design

The study evaluates the performance of design strategies on a ventilation system through a life cycle assessment and costing regarding the production, construction, and operational energy use stages.

A product's life cycle assessment consists of different stages where a greater weight in previous studies has been placed on either the production and construction or the operational energy use of the building. For a ventilation system, the operational energy use stage is considered to be the one with the significant environmental impact in comparison to the production and construction stage accounting for a larger percentage.

In pursuit of sustainable development within the building industry, there is a shift towards design strategies that are energy efficient and environmentally friendly. The study findings indicate that a Demand Control Ventilation system regulated with carbon dioxide sensors could lower the designed airflow volume to 80%-65% based on conducted interviews and measurements in a preschool. This reduces the energy demand by 55% and the environmental impact due to Global Warming Potential impact (GWP) by 55%-67%.

The study shows that focus can be placed on both the production and use stages by the implementation of efficient design strategies in the early stages to reduce the overall environmental impact of the system. The results indicate that measures related to installed material such as the use of recycled steel for the duct system in this study had a direct impact on the production and construction phase without affecting the operational energy usage of the ventilation system. However, measures related to energy efficiency such as the implementation of a Demand Controlled Ventilation system, had a direct impact on the operational energy usage without affecting production and construction stages.

Regarding cost, these design strategies have an additional investment cost for installed material. A Demand Controlled Ventilation system has an additional investment cost but results in energy cost savings, while the use of recycled material mainly impacts the environmental aspect but adds to the investment cost. Upon considering both the environmental and cost aspects the best-performing case varies depending on whether more weight was placed on the environmental or economic perspective.

Considering that there is a greater importance placed on either the production and construction or the use stage the aim of this study is to emphasize the importance of connecting both, considering the environmental impact and energy usage. This is relevant since the European Commission has a goal of becoming climate-neutral by 2050 and the United Nations has also developed Agenda 2030 to aid in the reduction of the environmental impact. The city of Malmö has also developed a local plan for achieving a climate-neutral construction and infrastructure sector in Malmo by 2030 – LFM30 that includes guidelines followed by this study.