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Engineered Insulation

Heat loss from homes and commercial businesses is an ongoing problem. This problem not only affects our pocket books, but it also affects our comfort and sustainability. The engineering goal of this project was to design insulation that is an active and effective solution to this problem. To do this, different designs for flat panels were built that could be evacuated of air. The resulting panel would have an insulation value not unlike an evacuated thermos bottle. A panel large enough to fit in between studs of a standard exterior wall must withstand the 22.5 tons of force that results. The relative value of different levels of vacuum was measured because no research was found indicating how much of an insulation value exists for various values of vacuum. A panel was built that had an effective R-value of 80. This is more than 4 times the value of standard fiberglass insulation. It was concluded that the insulation could be engineered and constructed. It was further concluded that it would need to be an active system with pressure transducers and a vacuum pump to maintain its insulation integrity. Widespread use of this insulation as a retrofit, or in new home construction could cut the consumption of energy for home and business by 6.6 quadrillion BTUs per year in the United States. It would also make solar energy a feasible heating alternative for most homes and businesses in the U.S.