

New refrigeration system uses 50% less energy than old system!

→ BACKGROUND

Alliant Energy designated Michaels Engineering to develop an efficient grocery store that would break the conventional design mold. Grocery stores have for decades used inefficient rack refrigeration systems because they are “reliable” and provide adequate backup in case of compressor failure. The systems are inefficient compared to design features employed by industrial refrigeration systems. Why can’t industrial refrigeration design elements be incorporated into supermarkets to make a quantum leap in energy efficiency? Michaels investigated.



→ MEASURES

Starting with an energy efficiency report provided by another utility, Michaels chose to take aim at the biggest energy user in any grocery store: the refrigeration system. Alliant Energy and Michaels presented Hy-Vee with a refrigeration system design that looks more like an industrial design than a conventional run-of-the-mill rack system. The design incorporates:

Open drive reciprocating compressors with step unloading. There are two compressors each for three suction temperatures, -30F, 20F, and 35F.

The low stage (low temperature) compressors discharge to the suction side of the high stage (high temperature) compressors. This two-stage compressor plant design saves significant energy.

The compressors discharge hot refrigerant gas to an evaporative condenser on the roof. The evaporative condenser has a variable speed drive to save energy. But more importantly, the evaporative condenser allows condensing temperature and pressure to be as low as weather conditions will allow. This greatly reduces compressor energy consumption.

→ ATTRACTIVE RESULTS

The industrial-type refrigeration system uses approximately 50% less energy than the conventional rack system, saving nearly 1.5 million kWh per year for a typical 80,000 square foot store. This is a reduction of about 30% for the entire store’s energy consumption, which includes lighting and HVAC. Additional measures including demand-controlled ventilation, kitchen hood exhaust controls, and efficient evaporator fan motors and fan blades were identified and implemented for an additional 800,000 kWh in annual savings.