Finally a new solution for vacuum cooling of vegetables

Vacuum cooling chamber on skid

Getting fresh picked vegetables to market has always been a challenge. Most vegetables are picked early in the morning when they are nice and crisp and covered in dew. However, as soon as a vegetable is picked the decaying process begins. One way of delaying this decaying process is by removing water from the vegetable. This process will increase the life of the product substantially, allowing the vegetable grower a significant increase in time to get the product to market.

The process that achieves this is **"evaporative cooling"**. Evaporative cooling is accomplished by pulling a **VACUUM** on moisture-containing products within a vessel or chamber. An increase in vacuum results in lowering the boiling point of the moisture, causing rapid evaporation. As the water evaporates, it absorbs the heat from the product and the temperature of the product is reduced.

Vacuum pump and condenser unit on flatbed

In this case the process is known as **"vacuum cooling of vegetables"**. To obtain adequate cooling, the vegetable must be subject to vacuum conditions that will reduce the temperature quickly to 40°F or lower without causing freezing damage or wilting.

After picking, the product is packed and placed in boxes or cartons, which are stacked on pallets. The pallets are packed into a large vacuum-tight chamber. This chamber can hold several pallets and has approximate dimensions of 9 foot diameter by 40 foot long, about the size of a railroad car. The vacuum system is connected to a large ammonia condenser. As the vacuum pump begins to evacuate the large vessel, the water starts to evaporate from the vegetables. As the vacuum in the process goes deeper, more water vapor is removed and the temperature of the product is reduced until the desired level is achieved.

The vacuum draws the saturated air or water vapor into the ammonia condenser. The ammonia condenser cools the saturated air and condenses the water vapor back into liquid water. The equipment operator continues to watch the process until a specific pre-determined vacuum level and temperature are achieved. Typically this vacuum level is approximately 5 Torr or 29.72" HgV at 35°F.

Vacuum cooling chamber with product on pallets

Once the specified vacuum level and temperature are achieved the operator can confirm he has removed enough of the moisture and has sufficiently cooled the vegetables to allow for maximum product life. The pallets with boxes or cartons will then immediately be packed into refrigerated trucks or railroad cars for shipment all over the country.

There is a new and better solution for vacuum cooling of vegetables using a vacuum booster system that offer several advantages.

DEKKER vacuum booster system

DEKKER™
VACUUM TECHNOLOGIES, INC.

For technical information see next page.

DEKKER booster system 1B2000-RVS0750N-FB

SYSTEM SPECIFICATIONS

Type of application:
Vacuum cooling of vegetables by evaporative cooling

Type of system or pump:
Full-recovery oil-sealed rotary high vacuum pump in combination with vacuum booster

System capacity and model no.:
Model 1B-------RVS----N.
Capacity to be determined

System components:
First stage vacuum booster
Second stage oil-sealed rotary high vacuum pump
Electrical control panel

System performance:
Inlet gas composition: air and water vapor. Inlet gas temperature: 110°F maximum

Evacuation:
Evacuates 9' x 40' chamber from atmospheric pressure to 4.8 Torr in 17 minutes or less

DEKKER custom engineered vacuum pump system for cooling of vegetables.

Vacuum cooling of fresh produce has been around since the 1950's. Initially, steam ejectors were used as the vacuum source, but these were replaced by mechanical vacuum pumps. For years, two-stage sliding vane vacuum pumps were the standard of the industry. These units used the once through oiling system, creating a considerable mess on the discharge of the pumps. Today, most pumps in operation are still of this design. Oil waste is also an increasing problem because of environmental concerns.

DEKKER was asked to come up with an alternative solution. The process requirement was for a pump system with a capacity of 2000 CFM with an ultimate pressure capability of 4 Torr, capable of handling considerable amounts of water vapor.

Because of DEKKER's extensive experience in the vacuum process industry, and hundreds of successful installations, DEKKER was able to design a system that would meet these stringent conditions. A combination of vacuum booster backed by a special design rotary high vacuum pump was used. The system has been performing extremely well and the customer is very happy with the performance and capabilities of this system, especially at high vacuum where the capacity by far exceeds the performance of the existing rotary vane units.