Geothermal Vegetable Dehydration at Brady's Hot Springs

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GEOTHERMAL VEGETABLE DEHYDRATION AT BRADY'S HOT SPRINGS

By John W. Lund

A number of hot springs, located about 80 kilometers (km) [50 miles (mi)] east of Reno along Interstate 80, were referred to as "The Spring of False Hope" by early travelers. The animals of these early wagon trains coming across the vast waste lands would smell the moisture, but, upon reaching the springs, found the water boiling. These springs have also been referred to as Hot Springs, Brady's, Springer's, or Fernley Hot Springs and are the Emigrant Springs of the Forty-Mile Desert.

In 1885, I. C. Russell of the U.S. Geological Survey (USGS) reported that hot boiling water issued from a number of springs and, when these became clogged by precipitation, the steam escaped from the narrow vents with a hissing and roaring sound. During this same period there was an unsuccessful attempt to separate boric acid from the waters. Later, hot water was used in a bathhouse and swimming pool which were located at a service station along the then U.S. Highway 40. The concrete pool, built in 1929, is all that remains today. The pool was apparently supplied by hot water directly from the springs. The hot springs do not flow at the surface today.

Prior to the drilling of geothermal wells in the late 1950's and early 1960's, the estimated spring flow was about 1.3 liters per second (l/s) [21 gallons per minute (gpm)]. The withdrawal of water during drilling may have caused the springs to cease flowing on the surface and now the present water level is 6 meters (m) [20 feet (ft)] below the surface. The original springs had a temperature of 82°C (180°F). Along with the Beowawe Geyser area, they have the highest steam-well temperatures in Nevada.

Twelve major geothermal wells have been drilled at the hot springs area over the past 25 years, ranging in depth from 104 to 2225 m (340 to 7,300 ft), with temperatures up to 214°C (418°F). In 1959, due to fluid escaping through the encased portions of a well into a fault zone, steam spread along a 4.6-km (3-mi) portion of the main north-south fault.

The geothermal waters at Brady's are of the sodium chloride type, with the total dissolved solids reported to be over 2,400 ppm. Calcite is reported to form rapidly in the well bores during flow, requiring reaming after a short period of time. The amount of scaling appears to decrease with time.

In 1978, Geothermal Food Processors, Inc., of Reno, Nevada, started construction of a geothermal food dehydration plant. Marvin Dommer, Ray Nash, and B. C. McCabe, Jr. were the original developers, and Magma Power Company the owners of the resource. A well located 396 m (1,300 ft) from the plant and supplying about 132°C (270°F) fluid was used in the plant.

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Funding for the plant was made available in part by means of a $3.5 million private loan guaranteed by the U.S. Department of Energy (USDOE) under the provision of the Geothermal Loan Guarantee Program. In 1979, the long-term debt was refinanced by Geothermal Energy Corporation under the direction of Paul Rodzianko of New York City. The vegetable dehydration plant started operations in mid-1979. The plant supplies dehydrated onions to Gilroy Food Company of California. In early 1982, the plant was purchased by Foremost-McKesson, Inc. The finished product is now being shipped to Foremost-Gentry of Gilroy, California.

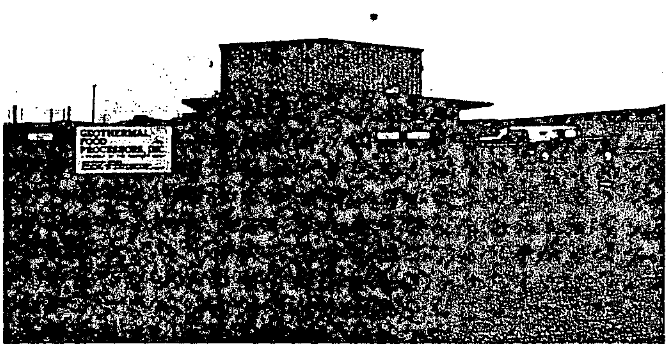

Figure 1. Vegetable Dehydration Plant of Brady Hot Springs

This plant is the first U.S. vegetable dehydration plant to utilize geothermal energy. The facility is housed in a 12- by 183-m (40- by 600-ft) building. An insulated pipeline supplies super heated geothermal water used to heat air circulated through a large Proctor & Schwartz model SCF 3-stage dehydrator. The hot water is pumped in succession through eight individual heating coils to provide heated air at decreasing temperature to the three main drying stages of the dehydrator. Double-filtered air is forced through the heating coils by powerful fans and passes through the bed of sliced onions on the conveyor in alternate up and down directions. After each pass, the moisture-laden air is exhausted.

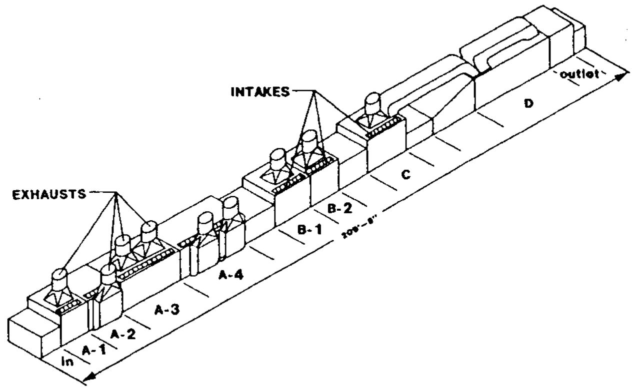

Figure 2. Single Line Onion Dehydrator

The three-staged dryer is 58 m (190 ft) long with a 3.8-m (12.5-ft) wide stainless steel conveyor belt. The dehydrator consists of three main stages: A, B, and C. The "A" stage contains five compartments using circulating air temperatures of around 88°C (190°F). The next stage, or "B" stage, has two compartments using air temperatures from 77° to 68°C (170° to 155°F). The "C" stage has three compartments and uses successively lower temperatures down to 49°C (120°F).

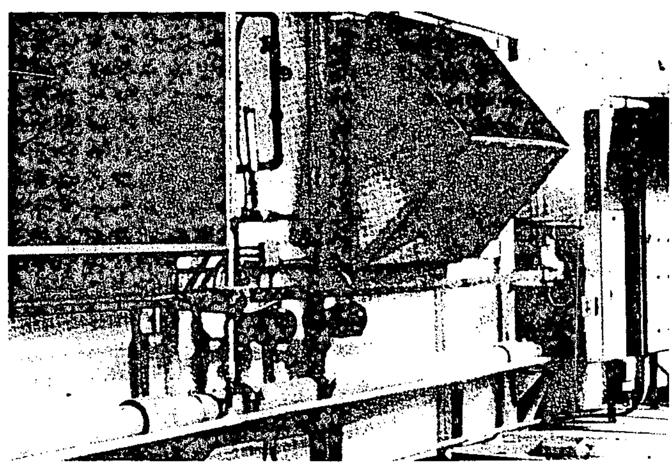

Figure 3. Fan Coil and Controls of Geothermal Dehydrator

The steps involved in the production and processing of onions for dehydration are as follows: curing, washing and preparation, slicing, dehydration, milling, quality control, and final packaging. Because of the oxygen-free and essentially bacteria-free nature of the fluid, use of the geothermal water during the wash helps to maintain the low bacterial count which is below industry standards.

The plant can process 4536 kilograms (kg) [10,000 pounds (lbs)] of wet onions per hour (at 15% to 20% solids) producing 680 to 816 kg (1,500 to 1,800 lbs) of dry product (at 95% to 96% solids). The plant operates 24 hours a day, seven days a week during the six-month season (May through October). During this time approximately 13 608 000 kg (30 million wet lbs) of onions are processed, producing 2 721 600 kg (6 million dry lbs). The geothermal energy replaces about 3.3 million cubic meters (116 million cubic feet) of natural gas annually at a savings of over a quarter of a million dollars. Approximately 75 persons are employed in the operation of the plant.

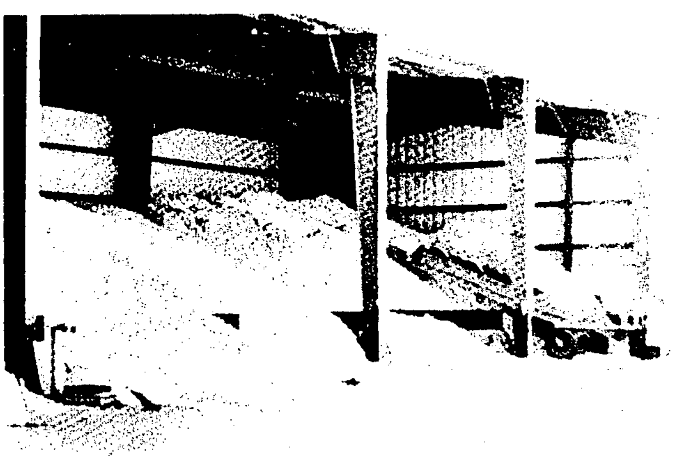

Figure 4. Onion Storage

The plant has also processed celery, normally starting after the end of the onion campaign and running into January, and carrots from March to April. However, due to the high cost of transporation for the raw products, processing of these two products has been discontinued.

It appears, because of the use of the local geothermal resource, Geothermal Food Processors have been able to produce a superior dehydration product. Color is generally excellent in large part because "hot spots" resulting from the heat of the burning natural gas improperly adjusted are eliminated since the lower temperature of the geothermal fluid cannot scorch it. In addition, bacteria-free fluids in the washing stages help keep the overall bacterial count low as compared with other processors.

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