

NITSCHELM, JENNIFER J.* , PETER J. REGITNIG, ANDREW LLEWELYN-JONES, Rogers Sugar Ltd, 5405-64th Street, Taber, Alberta, Canada T1G 2C4. **Temperature monitoring of sugar beet storage piles receiving forced air ventilation at different culvert spacings in Alberta.**

ABSTRACT

Since 1990, Rogers Sugar Ltd has utilized forced-air ventilation in a portion of the sugar beet piles to promote improved storage conditions. The climate in southern Alberta facilitates cooling, but precludes freezing, of sugar beets for long-term storage. High capital and operating costs of ventilation equipment have deterred expansion of the ventilation capacity under the current operating configuration. Increasing the spacing of ventilation culverts within the piles would allow an additional volume of sugar beets to receive forced-air ventilation, but the impact on storage temperatures was unknown.

In 1998, a four-year experiment was initiated to determine if the culvert spacing could be increased from 15-foot to 20-foot intervals without affecting storage conditions. To date, three years of data (1998/1999, 1999/2000 and 2000/2001 storage seasons) have been collected. In each year, a ventilated pile 28 feet in height was constructed, with 20 rows of ventilation culverts spaced at 15-foot intervals, and 20 rows spaced at 20-foot intervals. A non-ventilated pile was constructed at the same time as the ventilated pile in each of the three storage seasons. To facilitate temperature monitoring, hollow aluminum pipes 20 feet long were inserted vertically into the tops of the piles at regular intervals. Eighteen pipes were inserted into each of the three pile sections under study. Thermometers were suspended into the pipes to determine temperatures 6, 12 and 18 feet into the pile. Temperatures were recorded up to three times per week for the duration of the storage seasons.

For the majority of each storage season, ventilated sugar beet pile temperatures were between 0 and 4 °C. The non-ventilated piles were typically 4 °C warmer than the ventilated piles. Temperatures tended to vary more within the non-ventilated piles than the ventilated piles. The maximum and minimum temperatures observed on a given day in the non-ventilated piles differed by as much as 25 °C. For the ventilated piles, this range was usually less than 13 °C. In the non-ventilated piles, beets higher in the pile were cooler than beets lower in the pile. In the ventilated sections, this pattern was reversed; beets lower in the piles (and closer to the forced-air ventilation culverts) were cooler than beets higher in the piles.

Ventilation at 15-foot and 20-foot intervals maintained similar average pile temperatures in each of the three storage seasons. In two out of three seasons, daily ranges in temperature were similar in both ventilated sections; in 2000/2001, the difference between maximum and minimum daily temperatures was 1 to 6 °C greater in the 20-foot ventilated section than the 15-foot ventilated section. In all three years, temperatures of beets piled directly above a ventilation culvert versus halfway between two culverts did not vary significantly in the 15-foot ventilated section. In the 20-foot ventilated sections, beets tended to be warmer halfway between two culverts than directly above a culvert. This pattern was most pronounced at the 18-foot depths. However, the temperature of the 18-foot depth halfway between two culverts was never greater than the temperatures of the 6-foot depth directly over a culvert. Temperature profiles gathered during the three study seasons suggest sugar beet piles can be effectively ventilated at 20-foot culvert intervals.