Experiences with forced ventilation of sugar beet storage clamps in The Netherlands

Martijn Leijdekkers

Introduction

To minimize sugar losses of sugar beet in a storage clamp it is important to keep the beet as cool as possible, but frost-free. Therefore, respiration heat that is produced inside the clamp must be able to escape from the clamp rapidly by means of ventilation. Natural ventilation can sometimes be insufficient due to the dimension of the storage clamp, presence of dirt tare and/or weather conditions. In these cases, forced mechanical ventilation might be helpful to reduce the average storage temperature inside the clamp. From 2016-2018, the IRS has conducted several trials to test the use of forced ventilation in outdoor storage clamps.

Figure 1. Impression of storage trial set-up: reference clamp (top); construction of clamp with ventilation ducts (middle); overview of square-based clamps *with* and *without* forced ventilation (below).

Materials and Methods

Three storage clamps of approximately 500 tons of beet were made with different dimensions (l x w x h):

1. reference clamp, A-shaped (60 x 9 x 2.5 m);
2. square-based clamp (20 x 20 x 3 m), no forced ventilation;
3. square-based clamp (20 x 20 x 3 m), with forced ventilation.

Forced ventilation was obtained using two 2.2 kW fans, each connected to a metal half-round air duct. Fans were automatically switched on to ventilate for maximum 4 hours/day when the outside temperature was between 0-8 °C. All clamps were covered with Toptex® protection cover during storage (figure 1). Net bags with beet and temperature loggers were placed inside the clamps to measure the storage losses and temperature profile of each clamp. This trial was conducted in 2017/2018 (storage time 70 days) and was repeated in 2018/2019 (storage time 49 days).

Results

The temperature profile of the three clamps during storage is illustrated in figure 2. It is clearly shown that the average temperature inside the A-shaped clamp and the clamp with forced ventilation was consistently lower than the temperature inside the square-based clamp without forced ventilation. After 70 days of storage the difference was >150 degree days. Consequently, sugar losses and invert sugar content after storage were significantly different.

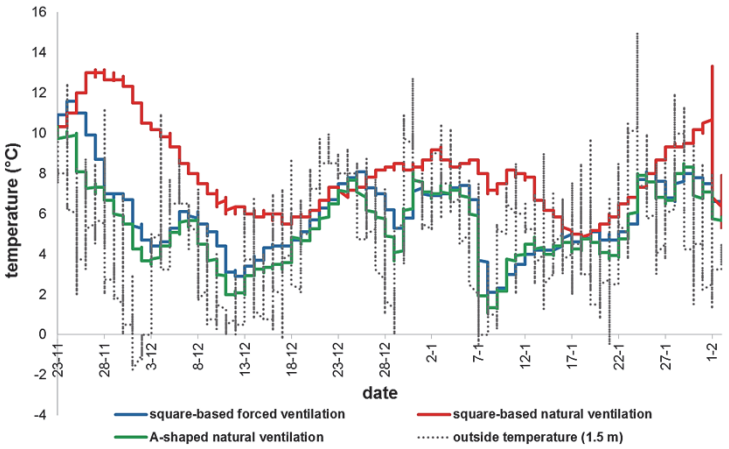

Figure 2. Temperature profile inside tested clamps during storage period.

Conclusions

- The use of forced ventilation in large square-based clamps significantly reduced the sugar beet storage losses compared to clamps without forced ventilation. However, the results were similar with sugar beet stored in A-shaped clamps.
- Forced ventilation enables rapid removal of heat from large square-based clamps. The temperature profiles of these clamps were comparable to those from A-shaped clamps without forced ventilation and were predominantly defined by the actual weather conditions (wind and temperature).
- Due to the costs and practical implications involved, forced ventilation will be economically feasible for large square-based clamps and long storage times (>2 months) mainly.

IRS *Institute of Sugar Beet Research*
Kreekweg 1,
NL-4671 VA Dinteloord
www.irs.nl
leijdekkers@irs.nl