Airflow measurements in apple storage rooms

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In storage rooms airflow is necessary to remove the field and respiration heat of the fruit. The fan operation for ventilation needs 30-40% of the total energy requirement for cold storage, e.g. for CA-storage of apples about 80 kWh per ton fruit and storage season. The research project 'COOL' was initiated in order to investigate the potential for energy saving and reduction of produce quality loss by optimizing the airflow management in cold stores.

In an apple CA-storage room (50t) at KOB Ravensburg airflow measurements were performed for determination of air speed distribution in the room with varying fan revolution levels (100%, 75%, 50%, 25%). At several bin positions air speed was measured inside the bins between the stored apples with a newly developed sensing device for flow measurements in macroporous media.

The air speed inside the bins depended strongly on the bin position in the stack and was much lower with ≤ 0.1 m s^{-1} than the speed in the gaps between the bins with values in a range between 0.3 m s^{-1} to 2 m s^{-1} at 100% fan revolution. Changes of the fan speed caused immediate adaption of the air speed between the fruit in the bins at stable levels. Up to a reduction of the fan revolution to 25 % at all chosen measuring positions air movement could be determined between the stored fruit.

The reduction of the fan revolution after the initial cooling period to 50 % did not impact negatively the apple fruit quality (firmness, TSS, acidity) after storage for 7 months.