



Potato Progress

Research and Extension for Washington's Potato Industry

Published by Washington State Potato Commission www.potatoes.com

Andrew Jensen, Editor. Submit articles and comments to: ajensen@potatoes.com

108 Interlake Rd., Moses Lake, WA 98837; Fax: 509-765-4853; Phone: 509-765-8845.

Volume II, Number 14

December 31, 2002

Variable Frequency Drive Fan Control for Potato Storages

William H. Bohl, Nathan Oberg, and Gale Kleinkopf
University of Idaho

While listening to the radio in the morning getting ready for the day, every now and then I hear an advertisement about how to conserve electricity. Suggestions include a lot of small things like turning off lights when not in use, washing full loads of laundry, and using energy-efficient light bulbs. Each suggestion may not save a lot of electricity, but collectively it adds up. An individual household electrical bill pales in comparison to the electrical cost of storing potatoes each month. Producers must run the storage ventilation system to keep potatoes in marketable condition, but can electrical cost for storing potatoes be reduced while maintaining quality? We'll explore the answer to that question in this article.

It wasn't so many years ago that storing potatoes for more than a few months was almost impossible. Now, developments in storage technology allow for successful potato storage for almost a year, which is critical to all segments of the industry. Long-term storage does not come without a cost; therefore, growers need to maximize their returns from the stored crop.

To help growers maximize their returns, Nathan Oberg and Gale Kleinkopf at the University of Idaho Potato Storage Research Facility in Kimberly are conducting research to evaluate the impact of ventilation system management on the potato storage environment.¹ The major components of this research focus on evaluating variable frequency drive (VFD) fan speed control and its effect on raw and processed potato quality, shrinkage, and electrical energy usage. The end result of this research will be the development of best management practices for ventilation system operation to maintain a suitable storage environment. But, just what is VFD?

Basically, a VFD allows a fixed-speed fan to operate at any speed from 0 to 100%. The big advantage of reducing fan speed is the energy savings. Granted, operating a fan at 50% of maximum speed provides about half the airflow as 100%, but the motor consumes only about 15% as much power. This may sound unbelievable, but fan laws – called affinity laws – dictate this relationship.

Many modern potato storages were designed to provide airflows of about 18 to 25 cubic feet per ton (cfm/ton). While these high airflow rates may be required immediately after harvest or if rot problems develop, much less airflow is typically required through the remainder of the storage season. Because less airflow is required for the majority of the season, VFD fan speed control may allow for significant energy savings.

Now that you know the theory of VFD operation, does it work? Oberg and Kleinkopf have tested a VFD fan control system in a commercial-sized storage facility using a 200,000 cwt double-bay

storage that has a split plenum. Each bay is equipped with its own independent bank of fans, control panel, and humidifier. Oberg and Kleinkopf manage one bay using a VFD fan control system, while the grower manages the other bay by turning off one or more fans during the storage season to control pile temperature. The VFD is linked to a control panel that automatically adjusts the fan speed based on the temperature difference between the plenum (supply) air and return air. Data from two years of research indicate that VFD fan control can reduce energy use by up to 50% compared to conventional fan control – fans being turned off and on by the storage manager – with no reduction in raw or processed quality. An added benefit of VFD fan speed control is that shrinkage was reduced.

Using a VFD fan control system can add up to big savings in potato storage electrical charges. For example, let's say your average electrical energy bill for storing potatoes is \$575 during November through June. By using a VFD fan, you could reduce your monthly energy charge to about \$287.

Using a VFD fan to store potatoes has many potential benefits. Energy consumption is decreased, resulting in higher returns from storing the crop, product quality is maintained, and there is a potential for less shrinkage. VFD installation is best suited for storages with an airflow volume of at least 15 cfm/ton. Storages with less airflow may not be able to reduce fan speed and maintain potato quality. Also, the payback for VFD installation is favored by a long storage season and high electricity costs. Keep these points in mind when considering a VFD fan control system for your potato storage facility.

¹Support for this research from the Idaho Potato Commission, Cascade Energy Engineering, and the Agri-Stor Company is acknowledged and is greatly appreciated.

About the authors: William H. Bohl is Extension Educator-Potatoes located in Blackfoot and can be reached at 208-782-3014 of wbohl@uidaho.edu; Nathan Oberg is Graduate Research Assistant located at Kimberly and can be reached at 208-423-6622 or noberg@kimberly.uidaho.edu; Gal Kleinkopf is Research Professor located in Kimberly and can be reached at 208-423-6666 or kleinkopf@kimberly.uidaho.edu. All are with the University of Idaho.

This article originally published in *the Spudvine*, on the web at:
<http://www.if.uidaho.edu/~bingham/spudvine.htm>.

Upcoming Educational Events

- | | |
|--------------------------------|---|
| <u>January 8th</u> | 8:00 am - 12:30 pm: Columbia Basin Potato Workshop, Best Western Hallmark Inn, Moses Lake. |
| <u>January 9th</u> | 8:00 am - 12:30 pm: Columbia Basin Potato Workshop, TRAC, Pasco. |
| <u>February 4th</u> | 1:00 - 4:30 pm: Potato Conference Spanish Language Session, BBCC Administration Building Auditorium, Moses Lake.
6:30 - 8:30 pm: Potato Conference Cultivar Performance Workshop, Best Western Hallmark Inn, Moses Lake. |
| <u>February 5th</u> | 8:30 am - 4:05 pm: Potato Conference, BBCC Wallenstein Performing Arts Building, Moses Lake. |
| <u>February 6th</u> | 8:30 am - 12:20 pm: Potato Conference, BBCC Wallenstein Performing Arts Building, Moses Lake. |

