



Valve Replacement Optimises Freeze-Drying Productivity



One of US' largest suppliers of freeze-dried ingredients modifies production lines

An application report by Rick Ouwenga, Jim Leenerman and Michael Sauter

- **Simpler and faster commissioning**
- **Approx. 15% reduction of the cycle time**
- **Considerable productivity increase with substantially less downtime including during servicing**

These were the results gained by one of the world's largest supplier of freeze-dried products, Van Drunen Farms out of Momence, Illinois, United States of America. By simply switching from ball valves to the 7010 and 7020 angle-seat on-off and control valves from Schubert & Salzer, Rick Ouwenga, Site Director-Tuthill Plant, estimates that the Return on Investment for retrofits at his plant was just a matter of a few weeks! Savings and ROI statistics mark incredible results with this change in valve technology.

Freeze drying is a complex and detailed technical process. Frozen raw products are placed into a refrigerated vacuum chamber. There, the frozen water (solid) is transformed directly into the gaseous state with an exact defined temperature/vacuum balance. Freeze-drying along the sublimation curve retains the cell structure, appearance, texture, taste and nutritional value of the finished product much better than other drying processes.

This was the reason why Van Drunen Farms made the decision many years ago (1985) to use freeze-drying for the refining of fruit for cereals, baking ingredients, soups, muesli, snacks, nutritional and sports supplements. The process specialists at Van Drunen Farms have more than 35 years of experience in freeze-drying. Surprisingly, when the new freeze-drying plant went into operation and they realized that it could be operated with a fundamentally higher productivity than was the case with all other technologies that had been used previously. It was obvious that this optimization was achieved and enhanced via the Schubert & Salzer on-off and control valves that had been installed in the steam system.

Rick Ouwenga who has been with Van Drunen Farms for the past 29 years and is now responsible for a production site with more than 100 employees, described it this way: "Our older plants are equipped with direct-acting control valves and three-piece ball valves for the control of steam. The new plant was equipped



Rick Ouwenga (l) and Jim Leenerman (r) with 7010 and 7020: "These valves provide us with multiple economic advantages – both in terms of the process and the operating and maintenance costs."

with valves from Schubert & Salzer ex works. It was clear very quickly that these series 7010 and 7020 valves provided a substantially flatter hysteresis when compared with the valves we had used in the past. This meant that we were able to run the tempering process with much greater efficiency – therefore being much shorter production times. This time savings alone results in a noticeable 10-15% reduction to the freeze-drying cycle, depending on the product."

Rick provided an example of the savings from one expensive, energy and time-intensive process: "We calculated a drying cycle of between 20 and 22 hours in the past when freeze-drying a ton of blueberries. The use of the 7010 on-off valves from Schubert & Salzer alone has enabled us to reduce this cycle time

by more than 3 hours. This is a giant win for us as not only do we optimise the energy efficiency, we also considerably increase our throughput in the plant.”

The specialists from Van Drunen Farms are so enthusiastic about the process benefits provided by the 7010 on-off valve and the 7020 control valve from Schubert & Salzer that they have already replaced most of the old ball valves on their existing plants with new Schubert & Salzer valves. As far as Rick is concerned, the main argument is the reduced resources consumption and the considerably increased throughput: “Our analysis has shown that we have a return on investment with the new Schubert & Salzer valves, together with 8049 digital positioners, within just a few weeks.”

Striking savings potential also possible during maintenance

Jim Leenerman, the Head of Repair and Maintenance at Van Drunen Farms, points to another aspect: “We have seen the risk of leaks in connection with the old ball valves.” Jim is the specialist that has been repairing and maintaining the freeze-drying plant for the past 15 years, he is also responsible for the steam system, the steam circulation and the vacuum pumps. He and his team of 4 employees keep things running smoothly during their two shifts to such an extent that operations continue to run without problems during the third unmanned shift.

Jim has in the meantime exchanged a large number of the old control and ball valves for Schubert & Salzer valves, most equipped with the 8049 positioner. “The main drawback of the ball valves in the older vacuum chambers is that the valves had some issues with particles that have been pressed into the seat area and therefore did not close 100%. Soiling can result in the vacuum chambers running at excessive temperatures despite the fact that the valves appear to be closed so that we then have to readjust them manually to cool them down. The valves from Schubert & Salzer, on the other hand, are less sensitive to soiling due to its plug and seat design. This eliminates the risk. This is the reason why we are consistently replacing all of the ball valves with 7010 and 7020 valves so that we can maximise our production efficiency and minimise downtimes further.”

And even if there should be a leak, this would not pose a problem for Jim, “no matter whether it is a 7010 on-off valve or a 7020



Placed in a refrigerated vacuum system, frozen raw materials are dehydrated without thawing. Thus, the ice in the product is sublimated into vapour.



Colour, shape, flavor and nutritional value are retained during the freeze-drying process better than with other drying methods.

control valve – these valves have a valve seat-seal that is made of PEEK and can be easily replaced without any difficulties should a leak occur. If a valve should start to bubble, then we open it in the line, replace the seat, put it together again and the problem is solved in a matter of minutes. We had to completely remove ball valves from the line and repair them which requires a great effort.”

Space-saving valve design

The series 7010/7020 angle-seat valves are characterised by a high degree of wear-resistance and a high service life. When compared with other seat valves, the angle-seat valves also have the advantage of the great space-saving arrangement in regard to the pipeline. The angular positioning of the valve body, the valve actuator and the positioner make it possible to mount and operate these on-off and control valves even in very small spaces. The actuator and the positioners are also very compact. When compared with traditional globe valves, angle-seat valves have high Cvs values with relatively small dimensions. This makes it easier to handle the valves and results in the overall valve weighing less. This is the reason why angle-seat control valves are used in a large number of industrial fields and their high service-life and reliable shut-off behaviour are ideal. This design can also be easily insulated, resulting in heat losses being substantially reduced at the valve.

Digital control valves for even greater efficiency

The specialists from Van Drunen Farms are currently focussing on resources efficiency and are therefore replacing the electro-pneumatic positioners with digital ones. According to Jim, “It is our opinion that electro-pneumatic positioners are no longer modern as they constantly consume compressed air. In comparison, the 8049 digital positioner from Schubert & Salzer only consumes compressed air when the position of the valve is altered by the control system. We believe that this is a savings potential that we are aiming for in the foreseeable future as a result of the consistent switching to the 8049 digital positioner. The commissioning of this digital positioner is also extremely simple and therefore saves costs: 2 buttons have to be pressed and the valve then calibrates itself.”

In addition to the simplicity of the 8049 digital positioner, a simple PC interface is available which provides the ability to make software adjustments within the unit but more importantly maintenance data can be downloaded which catalogs the complete

history of the unit. Diagnostic data can be taken locally at the positioner or with “deviceconfig” software and connection cable, an immense amount of information can be downloaded directly from the control valve.



The first four freeze-drying chambers started operating in 1986. Since that time, Van Drunen Farms has become one of the largest suppliers of freeze-dried ingredients in the United States. Today they are meeting growing consumer trends by farming and processing both organic and conventional products.

When taking everything into account, the commissioning, operation, maintenance and repair of these valves are not only simpler, but also considerably less expensive. Rick has clear plans for his future plant: “These valves provide us with multiple economic advantages – both in terms of the process and the operating and maintenance costs. It is therefore clear to us that all of the other valves and a large number of the positioners shall be retro-fitted with technology from Schubert & Salzer in addition to the efficiency of an additional 10 freeze-driers being optimized. We expect a payback within a few weeks as a result.”



Angle seat control valves type 7020 offer high flow capacity along with bubble tight shutoff reducing the need for isolation to the process. These control valves feature integral top mount integral positioners; pneumatic, analog and digital. Angle seat on/off valves typ 7010 offer millions of maintenance free cycles in difficult applications such as steam, gaseous media and contaminated liquids.

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Traditional Transatlantic Company meets Bavarian Valve Specialists

1856: the Van Drunen family emigrated from the Netherlands to South Holland, Illinois, in the vicinity of Chicago. Here, they started cultivating potatoes, peas, beans, onions, cabbage and carrots which they supplied to their customers.

1985: the company took the last step from an agricultural cultivation company to a refiner and processor of the cultivated products. Van Drunen invested in the first 8 freeze-drying plants for this purpose. It expanded within just a short period of time with 5 production sites in the Illinois region, a partner company in California, and a freeze drying production facility in Santiago, Chile, making it one of the world’s leading supplier of freeze-dried ingredients. In 2004, Van Drunen Farms opened the first freeze-drying plant in Serbia, offering expanded reach to our customers in Europe.

www.vandrunenfarms.com



Top: Van Drunen Farms is headquartered in Momence, Illinois. | Left: Arie and Anna, first Van Drunen immigrants in 1896. | Right: New freeze drying facility opened in 2015.

The roots of Schubert & Salzer Control Systems go back to the year 1883. A few years after the Van Drunen family emigrated, Carl Schubert and Bruno Salzer started with the manufacturing of sock knitting machines in Chemnitz. The first straight and angle-seat control valves made of brass and stainless steel were manufactured in 1974 and the first sliding gate valve with ceramic seat-set was presented in 1980. The first own-developed digital positioner was presented in 2007 with the first own electric motor actuator being presented in 2013.

Besides the angle-seat on-off and control valves, the Schubert & Salzer Control Systems technology spectrum includes sliding gate valves, ball sector valves, segmented disc valves, sanitary valves, pinch valves and diaphragm valves. The cooperation between Van Drunen und Schubert & Salzer has resulted in other processes also making use of the valve technology from Ingolstadt. In addition to the steam, on-off and control valves, Schubert & Salzer sliding gate valves are also used in the product flow or as steam control valves in very large vacuum chambers.

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