

PSA Case Study: Columbia Reach



Enhancing Apple Storage Efficiency: Columbia Reach's Transition to PSA Nitrogen Generation

Columbia Reach, a prominent figure in the apple storage industry in Yakima, WA, faced a critical challenge with their aging membrane nitrogen system. Seeking to improve efficiency, lower maintenance costs, and enhance storage capabilities for apples, Columbia Reach searched for potential solutions and found the PSA (Pressure Swing Adsorption) nitrogen generator offered by Storage Control Systems (SCS, Inc.).

Consistent Nitrogen Production is Critical

Nitrogen gas, coupled with a cooling system, plays a crucial role in the apple industry in controlled atmosphere (CA) storage facilities. By utilizing nitrogen gas, apple producers can effectively manage the storage environment to prolong the storage life and quality of the fruit. Nitrogen is flushed into CA rooms to displace oxygen, creating an environment with reduced oxygen levels which slows down the apples' natural respiration process. This extends shelf life and preserves flavor, color, and firmness. Additionally, nitrogen helps mitigate the development of storage disorders and rot during long-term storage. With precise control over nitrogen levels, apple producers can tailor storage conditions to meet the specific requirements of different apple varieties. Nitrogen can be delivered as a liquid, which is expensive, or generated on-site, proving to be a more cost-effective alternative. The two methods of on-site nitrogen generation are either membrane separation or PSA (Pressure Swing Adsorption) technology.



PSA vs. Membrane		
	PSA	MEM
Equipment Costs	✓	^
High Pressure Air Compressor	n/a	^
Horsepower Reqmts to Pull-Down Ratio	✓	^
Electric Usage	✓	^
Required Footprint	✓	^
Expandable Cabinet	^	✓
Local Service & Parts	=	=
Annual Maintenance (Consumable Parts Usage Costs)	✓	^
Projected Life	=	=
Total Lifecycle	✓	^
Cost of Ownership	✓	^

Quick Return on Investment

Knowing that the PSA system would require a smaller air compressor and be more energy efficient, Columbia Reach collaborated with Cascade Energy to do a free energy usage analysis to determine how the WATTSMART® program could benefit them. Following a 2-month process with Cascade Energy, they received an incentive offer and partnered with Storage Control Systems to implement a PSA Nitrogen Generator. Cascade Energy's incentive reduced the initial investment for Columbia Reach by over 29% and projects to yield an estimated annual energy savings of \$24,529.

The new PSA Nitrogen Generator at Columbia Reach delivers exceptional performance with flow rates of around 12,000 CFH (>200 CFM) at >99% purity. It uses a fraction of the horsepower of a similar sized membrane system. Emilio emphasized, "Before, we were just burning more energy, but now, the rooms reach setpoint quickly." Emilio looks forward to the upcoming season, expecting shorter pull-down times, a showcase to the enhanced efficiency and precision that the PSA provides. This gives Columbia Reach precise control over oxygen levels within their CA rooms, which in turn optimizes storage conditions for apples, improves fruit quality, and extends shelf life.

SIDEBAR: Energy Incentives

Cascade Energy, a leader in reducing energy waste in the Pacific Northwest, offers attractive incentives to companies seeking to enhance their operations while reducing energy consumption. Through their comprehensive energy analysis process, available for both new projects and retrofit equipment, Cascade Energy evaluates energy usage and offers incentives for implementing improvements.

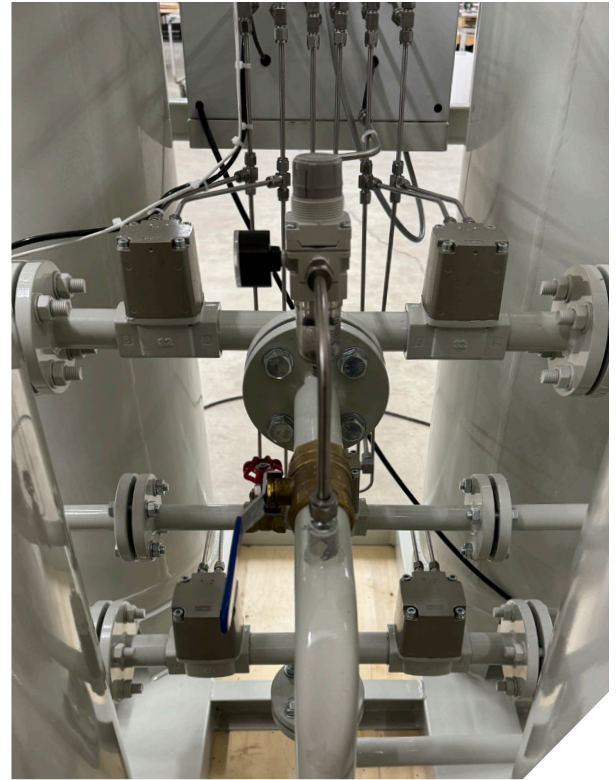
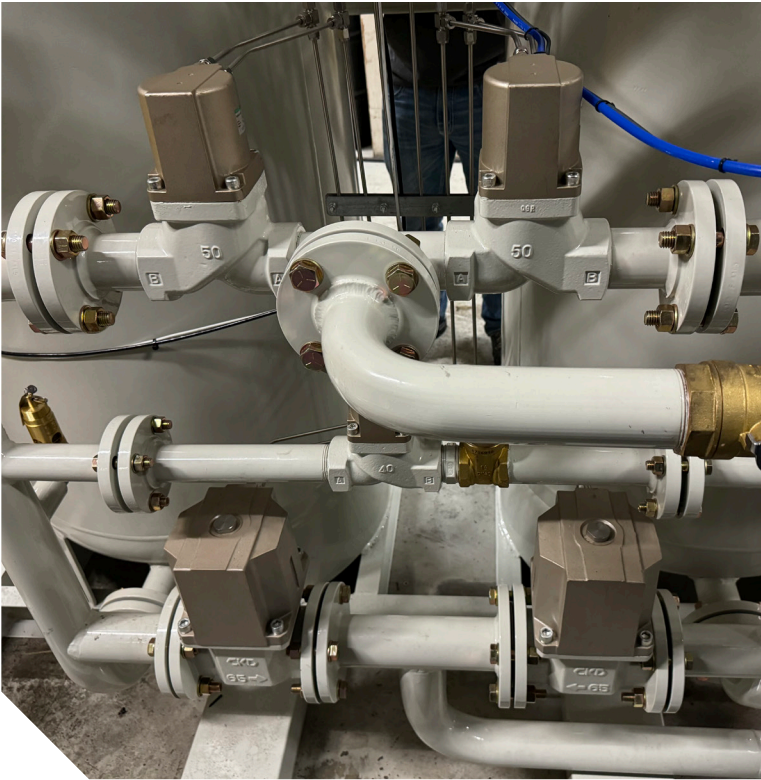
During the energy analysis process, which typically spans 2 to 3 months, Cascade Energy provides valuable insights and recommendations tailored to the specific needs of each project. As part of this process, Cascade Energy can issue a provisional Letter of Intent (LOI) savings letter, providing clients with confidence that there will be an incentive offered, so they may issue a PO to order equipment before the analysis is completed.

The energy savings consist of two key components:

One-Time Incentive: Clients may be eligible for a one-time incentive covering a large portion of the equipment cost, significantly offsetting the initial investment.

Annual Electricity Savings: In addition to the one-time incentive, clients can anticipate substantial annual electricity savings, some have seen savings range from \$20,000 to \$35,000 per year. These ongoing savings contribute to long-term cost reductions and operational efficiency.

By leveraging Cascade Energy's energy incentives and expertise, companies can achieve significant cost savings and a short Return on Investment. Contact Cascade Energy today for a free consultation to explore how their energy solutions can benefit your organization.



The Evolution of PSA Technology

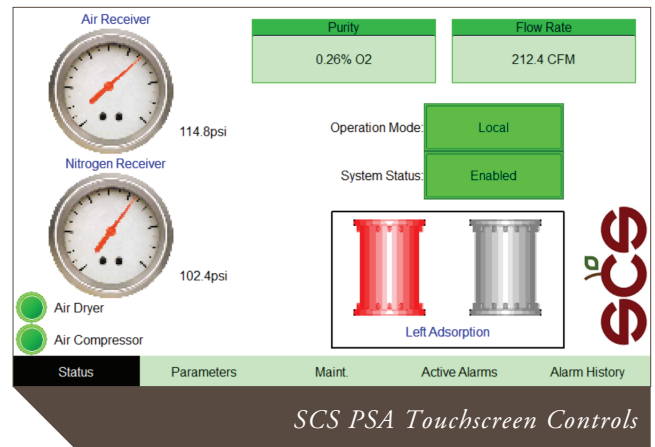
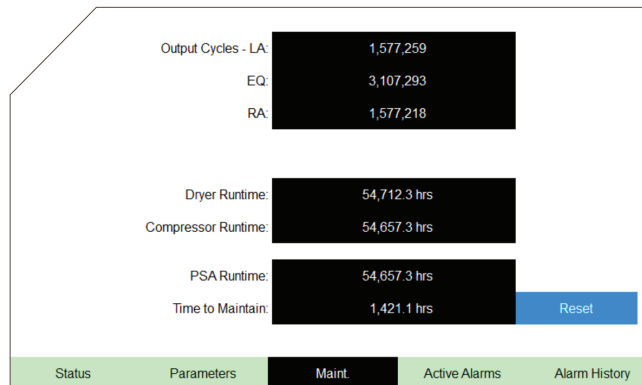
The membrane separation nitrogen system at Columbia Reach was becoming increasingly inefficient, burdening the company with lengthy pull-down times, high energy consumption, and high maintenance costs. Additionally, the system struggled to maintain desired low oxygen levels crucial for successful DCA (Dynamic Controlled Atmosphere) storage. With the apple storage industry evolving rapidly and adopting this storage method, they recognized the need for a more reliable and cost-effective solution to keep fruit at atmospheres of less than 1.0% oxygen to maintain quality for up to 12 months.

Columbia Reach considered implementing a new membrane separation nitrogen system. However, drawing from their current situation, they were hesitant due to the extensive maintenance requirements, and limited/variable life span of the membrane tubes themselves. Additionally, they acknowledged significant flow rate reductions when aiming for the low oxygen levels required for DCA storage. This would have required a considerable expansion in the size of the membrane system they needed as well as a larger air compressor.

Columbia Reach hesitated at first to consider PSA technology altogether. This reluctance stemmed from skepticism of Columbia Reach's head operator, Emilio, who had concerns about PSA reliability. Emilio's reservations were rooted in past experiences with older generation PSAs sold in the 1990s, which were equipped with spring or angle seat valves that often-created issues for operators. Emilio quickly learned that the SCS PSA generators have been updated with new pneumatic pilot operated valves with excellent durability, robust materials, and a life span of >80,000 hours more than a decade ago, with proven reliability. After 15 years, the maintenance needed to keep a PSA running efficiently is minimal and only a fraction of a membrane system.

Coordinated Effort Made Installation a Snap!

The timing to install the new PSA Nitrogen generator coincided with a mid-storage season equipment changeout. Collaborating with Emilio's team, SCS team members and local contractors efficiently replaced the equipment within a three-day timeframe. Once the equipment startup was finalized, Columbia Reach experienced firsthand the performance of the new system. Emilio remarked "I've never worked with a system like this that has such high purity without reducing the flow." Within 12 hours, the facility achieved the desired setpoints. The staff received comprehensive training on the operation of the equipment to learn how to control purity and flow rates, set alarms, and remotely adjust and monitor.



Bottom Line

The adoption of the PSA nitrogen generator has enhanced operations at Columbia Reach. "I wish I would have made this investment sooner. The precision control of the unit and software screens to view performance has made my team's life simpler, creating a peace of mind," concluded Emilio. With significantly reduced energy consumption and less lifecycle costs in parts and maintenance, the company has unlocked substantial cost savings. Moreover, they anticipate maintenance labor requirements will see a dramatic decrease, allowing for the reallocation of time to other critical tasks. With increased efficiency, reduced costs, and superior storage capabilities, Columbia Reach remains at the forefront of delivering high-quality apples to the market while meeting evolving industry standards.



Storage Control Systems, Inc., (SCS, Inc.) located in Sparta, Michigan with locations in New York, Washington, and the United Kingdom, is a full solution provider of controlled atmosphere storage and indoor farming solutions. Our services range from building design and construction, equipment of controlled atmosphere storage and indoor farming, energy management, cleaning and sanitizing and packing solutions. SCS, Inc. has been providing products, service and solutions since 1982 served by four generations of Schaefer family members. Inquires for SCS, Inc. products and services can be made by contacting us at 800.487.7994 or visit our website at www.storagecontrol.com/contact-us.

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