



DC ENERGY  
SERVICES

# SUN-MAID COMPRESSED AIR RETROFIT TO SAVE OVER \$300,000 IN ANNUAL ENERGY COSTS

## Compressed Air Upgrade Case Study

### Project Summary

- DC Energy compiled the resources to conduct a total systemic analysis of the existing compressed air system
- Title 24 exempt compressor equipment
- Substantial electrical and natural gas savings utility rebates approved for this client
- Dynamic review of pipe sizes and pressure losses
- Ultra-efficient compressors and desiccant dryers reduced plant air consumption by 600-1000 CFM
- Time weighted averages of power, pressure and flow meter logging incorporated into design of load shaping air storage and lower compressor target pressures
- Air system will utilize frame sequence and flow/pressure controls covering air demands of 0 to 125% of audit reference points
- Air system will provide full maintenance and advisory monitoring to plant desktop computers
- An Industrial Compressed Air System compliant with principals and concepts of the "Compressed Air Challenge "

### Background

California processes over 1 million tons of grapes per year and produces nearly 100 percent of raisins in the U.S. Processing and packaging raisins is an energy intensive process which involves substantial use of compressed air.



These facilities frequently operate continuously and require reliable, safe, and high-quality energy resources. Operations are generally non-discretionary- leading to limited options to curtail activities or otherwise reduce demand and usage. Moreover, processors such as Sun-Maid® often lie within air-quality disadvantaged communities. Site workers, residents, and visitors are subject to the full range of consequent adverse impacts. There is significant potential to improve the efficiency of current compressed air systems in food processing facilities by reducing runtime, recovering waste heat, and operating at lower pressures. Sun-Maid and its project partners sought to obtain a state-of-the-art compressed air system that would reduce its operating costs all the while increasing the facility's sustainability and reducing adverse impacts on local communities.

### Project Overview

Sun-Maid's Kingsburg, CA facility's existing compressed air and boiler system accounts for a significant percentage of the facility's energy and natural gas consumption. The project team worked to develop a California Title 24 compliant compressed air system that will be completely oil-free, provide more consistent flow and pressure while reducing energy costs, maintenance costs and potential for oil contamination. This project will reduce the total facility electrical energy consumption by 11.29% and natural gas energy consumption by 14%. The proposed equipment includes oil-free direct drive centrifugal and screw compressors with integrated variable frequency drive motor controls, heat of compression desiccant air dryer packages, a flow pressure controller and a waste heat recovery heat exchanger. As mentioned, the proposed centrifugal compressor features an "oil-less" design, meaning there is no oil used anywhere inside the machine. This ensures there is zero risk of product contamination



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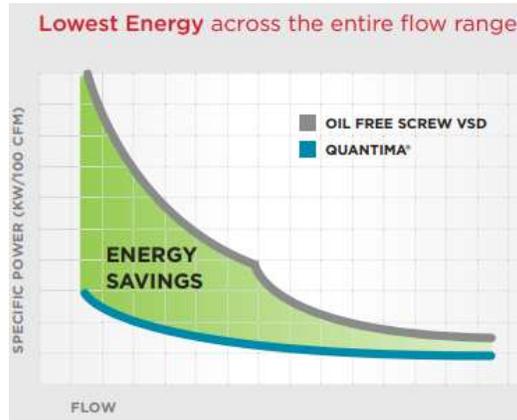


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due to oil carryover. The two-stage variable speed centrifugal compressor provides unmatched efficiency due to its low level of energy consumption and it's incredibly low off load power consumption. These off load power savings, along with improved efficiency, result in approximately 25% lower energy consumption compared to a two-stage variable speed oil-free rotary screw compressor. Additionally, the proposed compressors allow for a significant amount of heat recovery, allowing the facility to offset boiler usage for heating hot water.



### Incentives & Grant Funding

DC Energy worked closely with the Sun-Maid team to apply for multiple sources of project funding to offset capital investment. As a result, Sun-Maid has received a notice of award from the California Energy Commission's (CEC) Food Production Investment Program (FPIP) in the amount of \$805,584. The CEC established the FPIP in response to California Assembly Bill 109 and is focused on providing support to California food production facilities to encourage the implementation of energy efficient and/or renewable technologies to ultimately reduce operating costs and greenhouse gas (GHG) emissions all the while keeping these facilities competitive and operating in the state of California. This project is an excellent example of the success the FPIP is bringing to California food processors. Additionally, Sun-Maid received approval from local gas and electric utilities for incentive funds of approximately \$300,000 to support the project.

### Results

An in-depth analysis and measurement and verification (M&V) of the compressed air system performance was conducted. The system study results indicated that the varying production demand would be more effectively served with an appropriately sized and stepped compressed air supply system. The existing system provided very little turn down for low demand requirements and the air dryer design represented a large portion of the system demand at over 600 SCFM. In addition, the system demonstrated deviations of operating pressure +/- 10 PSIG with an operating pressure well over 100 PSIG. DC Energy Services determined that the new redesigned system proposed by Process Air Solutions would result in approximately 2,000,000 kWh/yr of electrical savings as well as 200,000 therms/yr of gas savings, saving Sun-Maid over \$300,000 in annual gas and electric costs. As a result of the electric and gas usage reductions, Sun-Maid will reduce their carbon footprint by approximately 1,138.64 metric tons of carbon dioxide equivalent (MTCO<sub>2e</sub>) per year. With a project cost of \$2,000,000, Sun-Maid's investment into upgrading their compressed air system will pay back within two years after taking into account the utility incentives, CEC FPIP grant and annual energy cost savings.

## Project Partners

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