

## REBEL FARMS SELECTS MOLEAER NANOBUBBLE TECHNOLOGY TO MAXIMIZE GROW OPERATION

Rebel Farms is a 15,000-square-foot greenhouse in Denver, Colorado that predominantly grows surrey arugula and other select leafy greens like watercress and kale for major restaurants in the Denver area. They take pride in supporting the local farm-to-table movement and are a choice vendor for well-known top chefs like Troy Guard and Jennifer Jasinski.

Rebel Farms utilizes a pesticide-free, hydroponic, nutrient film technique (NFT) greenhouse. The NFT recirculates a film of water including nutrients and dissolved oxygen (DO) across the bare roots of the plants in watertight gullies known as channels. Oxygen is a critical macro element for plants that boosts the metabolic rate and nutrient absorption, resulting in healthier and more vigorous growth. Since DO and nutrients are consumed by the plants as the nutrient water film travels across the channel, plant growth further down the channel is often stunted due to oxygen deprivation. To fully realize the yield potential of the greenhouse, enough nutrients and DO need to be supplied across the full length of the channels.

Prior to installing the Moleaer nanobubble generator, Rebel Farms was struggling to deliver enough oxygen to their plants and was looking for a way to effectively increase the DO in their system. To remedy this, Rebel Farms installed a 25 gallon-per-minute Moleaer nanobubble generator to serve 200 channels, each 16 feet long with 47 plant sites, totaling roughly 9,400



Lauren Brettschneider & Jake Olson, owners of Rebel Farms, standing proudly in front of their hydroponic greenhouse system that serves their local community.



The Moleaer nanobubble generator is easy to integrate into an existing hydroponic system.



Moleaer oxygen nanobubbles promote stronger root systems and larger, healthier plants.

**Client:**  
Rebel Farms

**Type:**  
Hydroponic NFT

**Unit Type:**  
25 GPM

**Installed:**  
June 2018

**Benefits:**  
300% DO Increase  
22% Increased Yield  
16-Month Payback Period  
Reduced Cultivation Time

**Greenhouse Size:**  
15,000 square feet

plants per cycle. After installing the Moleaer nanobubble generator, Rebel Farms saw the DO rise to 18 parts per million. With the sustained increase in DO, plant volume increased 22%, and the growth cycle reduced from 10 weeks to 8 weeks, significantly increasing total revenue. The owners also noticed that the plants looked healthier and had much larger root systems.

Moleaer nanobubbles provide certain benefits compared to other conventional aeration methods. First, the volume of nanobubbles produced by the Moleaer system exceeds 500 million per milliliter of water. At this volume, the interfacial surface, or the area where the water interacts with the nanobubbles, is very large. This allows for an oxygen transfer efficiency of nanobubbles to DO of up to 85%. Second, the nanobubbles stay suspended in solution because they do not rise to the surface. By staying suspended, they act as a type of oxygen battery in the water, diffusing more oxygen as the plants consume oxygen from the water. In an NFT system, this helps to ensure plants at the end of the channel receive elevated levels of oxygen, allowing them to take up more nutrients and thrive.

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