# NYB SAVES AGRICULTURAL FIRM MAINTENANCE COSTS AND REDUCES SAFETY RISKS

## WITH A SIMPLE BUT EFFECTIVE INTERIM SOLUTION TO FANS OPERATING IN STALL MODE


## Summary

In a recent application, the New York Blower Company (nyb) was contacted by a major US agricultural firm that was experiencing vibration issues and air performance deficiency in their grain dryers installed in facilities throughout the country. During operation, representatives at one of their facilities had noticed a fluctuating sound emanating from the fan and a visible deflection in the fan structural components induced by vibration, raising immediate concern.

While the fans were originally installed by a competitor fan manufacturer, the customer was dissatisfied with the support they had received from their original vendor and reached out to nyb's repair services to diagnose and resolve the issue.


## OVERVIEW

**Industry** - Agriculture

**Application** - Grain Dryers

**Problem** - Increased pressure in the fan due to more dense grains.

**Solution** - Replacement of the fan

## Problem

The facility had started having problems with their grain dryers when they switched the density of the grains they were processing. Where they had previously processed whole grains (less dense), they had recently switched to processing shelled grains (more dense). This increased pressure in the fan, pushing the fan into an unstable "stall" region of operation that led to further issues including longer drying times, inconsistent results, and excessive vibration that was prematurely wearing out the fan components.

### What was happening inside the fan?

The grain drying process begins by preheating ambient air through burners at the inlet box of a backward inclined centrifugal fan. A rotating impeller inside the fan adds kinetic energy to the airstream with a portion of that energy converted to static pressure through the casing volute, which is then exhausted into a plenum with a perforated metal plate above the fan outlet. Air then passes through the grain to remove moisture.

This process creates a resistance to airflow that is proportional to the density of the product; therefore, an increased average grain density moves the operating point to a lower flow rate along the fan characteristic curve. If this density is increased enough, the operating point will be pushed left of the peak pressure generating point on the fan characteristic curve. This is known as the stall region,

which represents an area of unstable performance. It is recommended that a fan operate below peak static pressure to avoid variations in the system that may push the fan into the stall region.

### The risks of operating in the stall region

Operating in the stall region not only slows the drying process, but it also causes excessive vibration that can lead to premature failure and higher maintenance costs. Continued operation in this region puts the customer at risk of costly unplanned downtime, and it makes operation hazardous to human safety and any equipment adjacent to the fan. The safety concerns were particularly urgent in this application considering that the burner at the inlet of the fan is connected to a gas line. In the event of catastrophic failure, the gas line could be severed, leading to a potentially explosive gas leak.

## Solution

In a scenario like this one, nyb typically recommends fan replacement as the most appropriate long-term solution, as the existing fans were no longer supporting the process change. However, the customer opted to repair and modify the existing fan systems in the short term to minimize operational disruptions during their busiest grain processing season. Therefore, nyb engineered a short-term solution that would enable them to quickly get the fans back online and operating in a safe and stable region.

After discussing the issue with the customer representatives, nyb engineering recommended an economical approach that leveraged existing equipment, maximized drying time, and reduced the safety and mechanical risks caused by the high vibration levels.

The interim solution was simple: offload some of the pressure from the fans by installing a ductwork branch to the fan outlet and adjustable bypass dampers connected to the outlet of the fan between the fan and the grain. This caused an intentional leakage from the system into the grain plenum. This reduced the pressure to the system via what was essentially a waste valve (see illustration below).

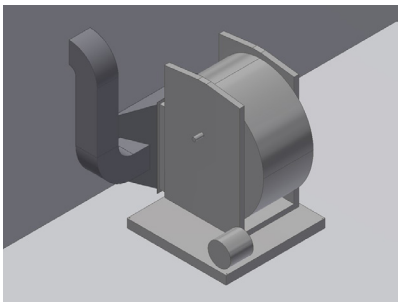

Figure 1: Design concept - bypass exhausted into grain plenum

To optimize efficiency, the bypass damper allowed the customer to tune the fan to the level of “leakage” that was needed during the process. Furthermore, nyb provided prefabricated ductwork and dampers, which meant minimal time-on-site for modifications of the system.

## Results

nyb successfully modified the customer’s grain drying fans with an economical interim solution that helped them speed up drying time, reduce safety risks, and save maintenance time and costs–all without the high costs and downtime of replacing the fans during their busiest season. With just a few simple design changes, nyb was able to offer a cost-effective interim solution to the customer’s ineffective system, designed to meet the unique constraints of the application.

For more information visit nyb.com or contact us at 800-208-7918.

**The New York Blower Company** uses advanced testing technology and experienced engineers to determine the best solution to a variety of problems, ranging from corrosion to excessive wear to high vibration and unbalance. Regardless of the original manufacturer, reverse engineering is utilized to repair, replace, and retrofit complete fans or component parts. With over 130 years experience, trust the industry experts.