# RECOMMENDATION ${REC}: INSTALL INDUSTRIAL FANS TO IMPROVE AIR CIRCULATION

### Recommended Action

Install large industrial fans in the production area to improve air circulation.

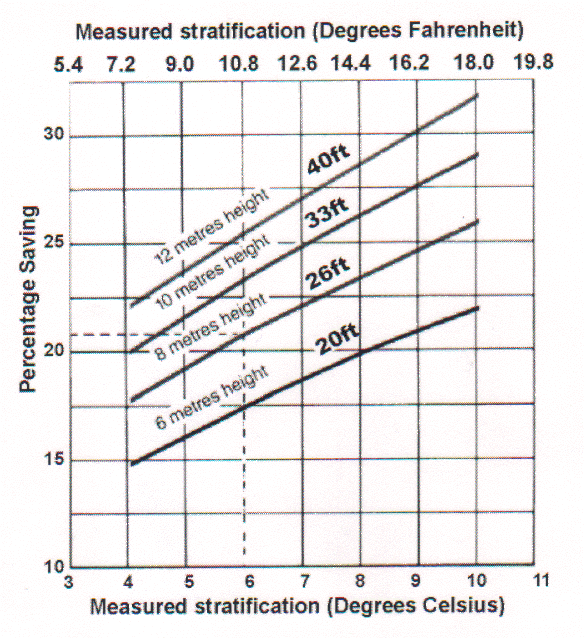
**Summary of Estimated Savings and Implementation Costs**

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| --- | --- |
| Annual Cost Savings | $4,283 |
| Implementation Cost | $45,000 |
| Payback Period | 10.5 years |
| Annual Natural Gas Savings | 700 MMBtu |
| Annual Electricity Savings | -1,938 kWh |
| Annual Demand Savings | -11.2 kW |
| ARC Number | 2.7312.3 |

**Current Practice and Observations**

Currently, the plant does not have any fans installed to allow for proper air circulation throughout the production area. Therefore, the heating system operates inefficiently during winter, and there is poor ventilation during the summer. As cold air is denser than hot air, it settles on the working layer, and the hot air floats up to the ceiling, which causes the heating system to run at a higher load to supply a comfortable working environment. Destratification fans can be used to pull the air from the ceiling level down to the floor level and allow it to mix with cooler air to increase the temperature at the working level. This will reduce the energy use of the heating system. In addition, these destratification fans can replace multiple small fans that are currently being used in the facility during summer time.

A recent computational fluid dynamics, CFD, study, performed by the Building Services Research and Information Association (BSRIA), quantified percentage energy savings by destratification fans as a function of ceiling height and measured stratification (temperature difference between the floor and the ceiling). Figure below shows the percentage energy savings as a function of stratification temperature and ceiling height.



**Figure 1:** **The percentage energy savings as a function of stratification temperature and ceiling height.**

**Anticipated Savings**

An estimate of the savings which could be realized through installation of the large fans can be made by using the following approach. It is recommended to initially install ten 33 ft. diameter industrial fans to cover the entire operating area.

The natural gas nergy savings, NGS, is calculated as follows:

NGS = PR × NGU

where,

PR = Percent of reduction in natural gas consumption (conservatively assumed to be 10%/yr)

NGU = Anuual natutal gas usage for heating, MMBtu/yr (estimated: 7,000 MMBtu/yr).

NGS= 10% × 7,000 MMBtu/yr

= 700 MMBtu/yr

The extra electricity consumption, ES is calculated as :

ES = -N × HP × C1 × OH

where,

N = Number of proposed fans: 10

HP = Horsepower of proposed fans: 1 HP

C1 = Conversion constant, 0.7457 kW/HP

OH = Operating hours of existing fans, 1,040 hrs/yr. (8 hours per day, 5 days per week, 26 weeks per year)

ES = -10 × 1 HP × 0.7457 kW/HP × 1,040 hrs/yr

= -7,755 kWh/yr

The extra demand consumption, DS, is evaluated as follow:

DC = -N × HP × C1 × 6 mo/yr × CF

where,

CF = Coincedence factor: 100%/mo

DS = - 10 × 1 HP × 0.7457 kW/HP × 6 mo/yr × 100%/mo

= - 44.7 kW/yr

The total annual cost saving, ACS, is:

ACS = NGS × natural gas cost + ES × electricity cost + DS × demand cost

= 700 MMBtu/yr × $7.44/MMBtu - 7755 kWh/yr × $0.075/kWh - 44.7 kW × $7.68/kW

= $5,208/yr – $582/yr - $343/yr

= $4,283/yr

**Implementation Cost**

Based on a price of $4,500 each industrial fan including installation, The implementation cost of 10 industrial fans is about $45,000.

**The annual natural gas savings for this AR would be 700 MMbtu. The annual electricity savings is -1,938 kWh and the annual demand savings is -11.2 kW. The estimated annual cost savings is $4,283 and, with an implementation cost of about $45,000, the payback period would be about 10.5 years.**

**Implementation Cost References:**

The below links are for implementation cost references. We do not endorse/recommend these brands or products. Furthermore, these products may or may not be suitable for the application. The client should contact a vendor(s) to conduct a detailed study of the process, in order to determine the best product for the recommended application.

* <https://store.bigassfans.com/en_us/shopfan>
* <https://www.northerntool.com/shop/tools/category_fans+big-ass-fans?seeAll=1>