



ANALYSIS AND CONSTRUCTION OF DESCRIPTIONS OF PERFORMANCE ADJUSTMENT METHODS OF CENTRIFUGAL FANS

Almalyk branch of Tashkent State Technical University,
Republic of Uzbekistan , Almalyk city
Ganiyev Sarvar

ANNOTATION In cases where air productivity varies in ventilation systems used in the industrial sector, analysis of productivity management methods, as well as the construction of graphical descriptions of changes in the parameters of ventilator devices that occur in different tuning methods.

Keywords: drosselling, pulley, centrifugal fan, airspeed, guidance apparatus.

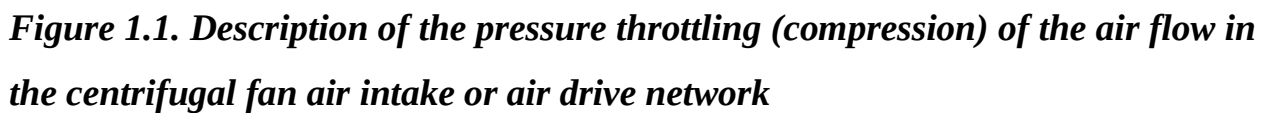
Keeping the air exchange at the required ratio is achieved by changing the supply of ventilators, affecting the air transfer network, the fan and the fan driver. The choice of the method of changing the air flow of fans is made based on the analysis of different regulation methods.

Adjusting the fan mode means changing its performance. Changing the performance of the fan is carried out in two ways: qualitative (high quality) - by changing the working characteristics of the fan, and quantitative (high quality) – adjusting by changing the characteristics of the network.

A valuable adjustment method is performed by changing the resistance of the air pipe. This is done through throttles and throttles.

The value adjustment method is very simple but of very low quality, because in this process, the amount of air driven due to the obstruction in the air duct is changed, but the voltage of the fan increases, the consumption of electricity does not change.

Throttling is a common technique used in ductwork, but throttled air stress is also part of the fan driver load.



In the method of changing the geometric parameters of the fan, it is possible to change mainly two parameters: by changing the angle of inclination of the guide device at the entrance of the fan and by changing the angle of inclination of the impeller blades.

An increase in the angle of inclination of the device at the entrance of the fan causes a lower amount of air entering the fan. In this process, the network characteristic of the fan changes, but the energy consumption decreases due to the low air resistance to its working wheels.

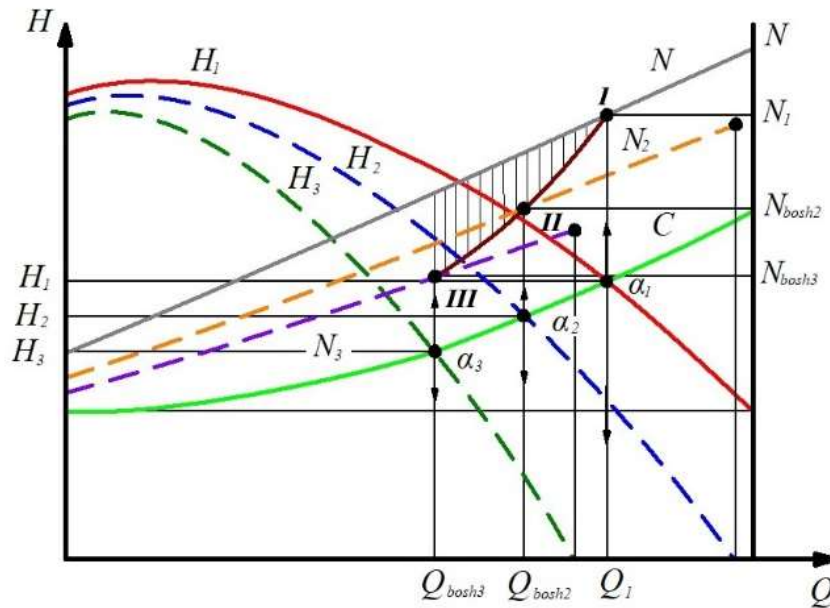


Figure 1.2. Description of changing the angle of the guide device in the centrifugal fan air intake or drive section

One of the advantages of a reference device is its ability to perform adjustments directly during operation. The guiding device is installed directly on the air intake part of the spiral shell and can change its angle of inclination from 0-60° on the rotating axis. Low air intake is directly related to the performance of the air delivered to the working wheels. There are also several disadvantages of the guide device, which include a large change in the load on the blades due to the fact that the number of revolutions of the working wheels does not change under the conditions of non-uniformity of the efficiency of the intake air. As a result, the bearings of the working wheel shaft quickly fail. The use of the guide device together with the angle adjustment parts causes an increase in the size of the fan.

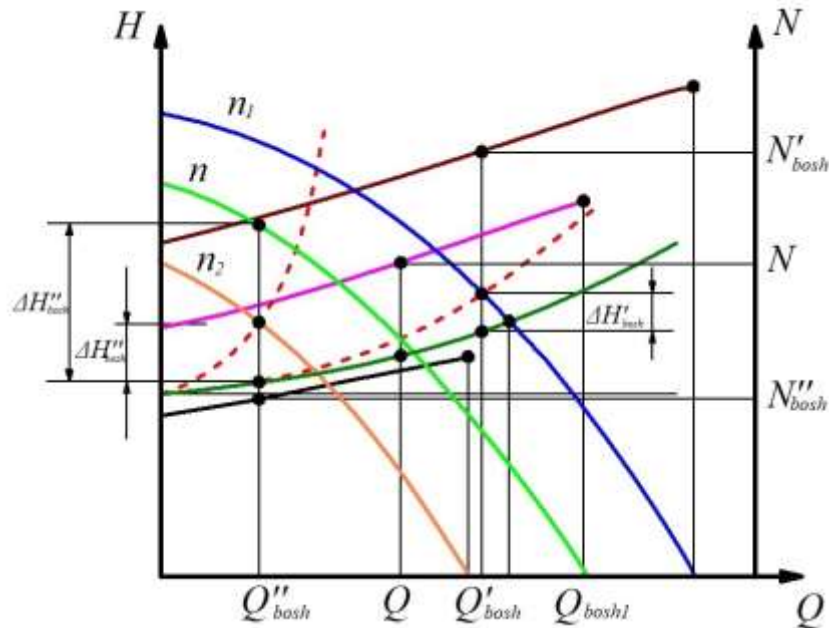


Figure 1.3. Description of centrifugal fan air flow adjustment in mixed method

Change the performance by changing the angle of installation of the fan impeller blades. This method is considered to be the same method for axial and centrifugal fans, and it is a method of changing the location (angle of location) of the blades of the working wheel, which is the main working body. Changing the position angle of the impeller blades is a complex process and is made directly into the design of the fan, taking into account the efficiency during the design of the fan. This method is mainly used in fans with a large capacity and designed to serve for a long time. It is known that the working zones that require ventilation experience irreparable stress and losses over time, and as a result of the increase in the production volume, the demand for increasing the ventilation efficiency increases. In such cases, it is effective to use variable pitch fans designed for pre-variable performance.

Changing the fan performance by changing the position angle of the blades of the impeller is used for sudden changes in the required air performance in the area being ventilated. Impeller blades are usually made by welding or stiffened with stiffener bolts. Changing their direction means changing their geometric structure,

which is a rather complicated process. As an advantage of this method, we can mention that the designed fan will serve for a long time and thereby reduce the consumption costs. For example, this method is used in mine ventilation devices. This method also has its drawbacks, as the power required from the driver changes along with the performance after changing the position angle of the blades. As a result, when the angle position is changed, a new driver must be selected for this fan. Also, due to the fact that it is difficult to ensure equal weight and synchronous rotation of the reoriented working blades, the level of wear and tear in the fan equipment increases. Another method of value adjustment of productivity is the method of changing the number of revolutions of the impeller, which is considered the most effective method and is widely used today. The number of revolutions of the impeller is a factor that directly affects the air efficiency.

$$p = \frac{\rho_x}{2} \cdot v^2 \quad v^2 = \frac{Q}{F_0}$$

Q - productivity; F_0 - Air ride surface; p - pressure; v - speed; ρ_x - air density.

Changing the speed of the impeller does not require changes to other structural parts, so only the network description of the fan changes in this part.

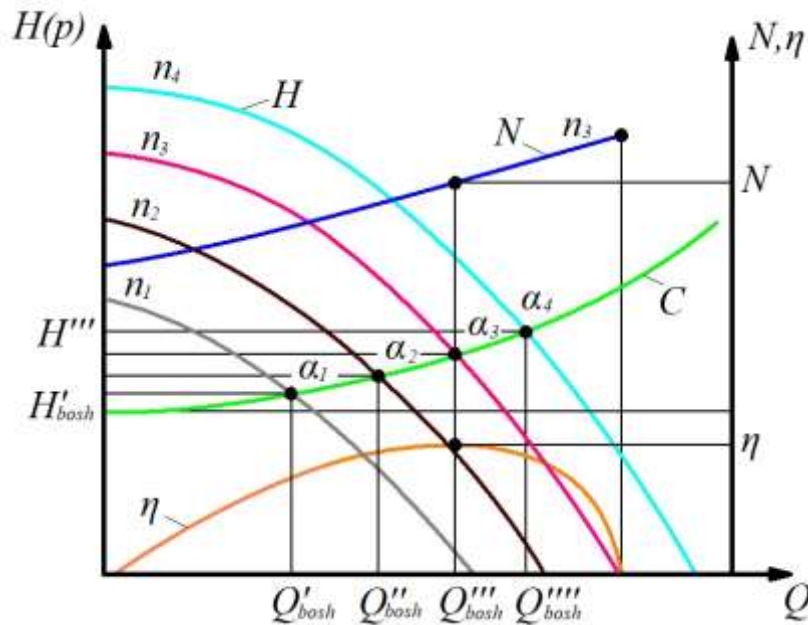


Figure 1.4. Description of adjusting the air flow by changing the speed of rotation of the centrifugal fan impeller

The most effective way to adjust the efficiency of centrifugal fans depending on the application area is to change the speed of the impeller. There are two ways to change the speed of the fan impeller: by changing the size of the fan drive pulley and directly by changing the speed of the electric motor. Replacing the transmission pulley is a complicated and somewhat inefficient method, because it requires a complex structure and additional equipment, and the simultaneous use of pulleys of different sizes causes an increase in the load on the electric drive. One of the most effective ways to adjust fan performance is by controlling the drive speed, which allows for a wide range of external network specification parameters. It is also possible to achieve energy savings by adjusting the parameters of the electric drive in relation to the required performance. It is also possible to fully automate the ventilation process by accurately calculating the required performance mode and obtaining change parameters.

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