DON'T SPEND MORE ENERGY THAN ACTUALLY NEEDED.

THE MAGIC FORMULA FOR ENERGY EFFICIENCY: SPEED CONTROL.

The EU issued a resolution that energy has to be saved on a large scale in the years to come. Industry and commerce are requested to critically examine and optimise all processes with regard to their energy efficiency. Process fans from REITZ with speed control point the way to efficiently saving energy and costs.

Energy efficiency -
Europe's ruling future topic

The EU Directive 2006/32/EG determines:

§ 1: In the Community there is a need for improved energy end-use efficiency …

§ 2: Improved energy end-use efficiency will also contribute to the reduction of primary energy consumption, to the mitigation of CO_2 and other greenhouse gas emissions and thereby to the prevention of dangerous climate change.

DON'T SPEND MORE ENERGY THAN ACTUALLY NEEDED. IT IS THE SPEED THAT COUNTS.

Today's ventilation plants with square-law performance curves all employ the same control technique:

Dampers and inlet guide vanes are controls of mechanical type. Their mechanisms control the fan performance at constant motor speed. That is to say: when the motor operates at full speed but the fan requires only 50% of its power, the considerable surplus energy is simply wasted. This loss in energy could be saved with a speed control.

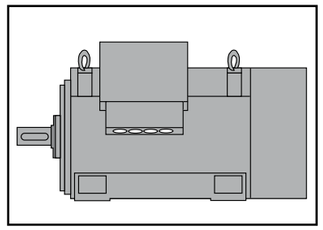
With the **speed control technique**, however, the fan performance curve can be exactly adapted to the plants performance curve by changing the fan speed with the frequency converter. The pressure loss or resistance that is present in the plant system depends on the quantity of gas that is to be handled or volume flow. The speed controlled fan produces exactly that amount of pressure increase in the individual operating point that the plant requires for overcoming the resistance.

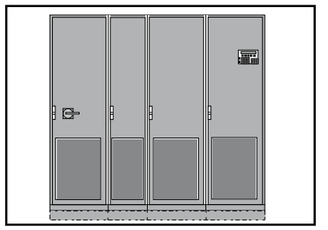
30% LESS EXPENDITURE OF ENERGY - BUT NOT AT THE COST OF A LOSS IN EFFICIENCY.

REITZ' fan systems with speed control consist of three exactly tuned components. Due to the reduction of costs, the additional costs for the speed controlled system will normally amortise within two years.

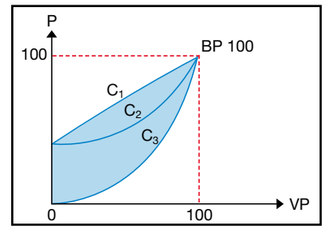
fan

motor





max. energy efficiency



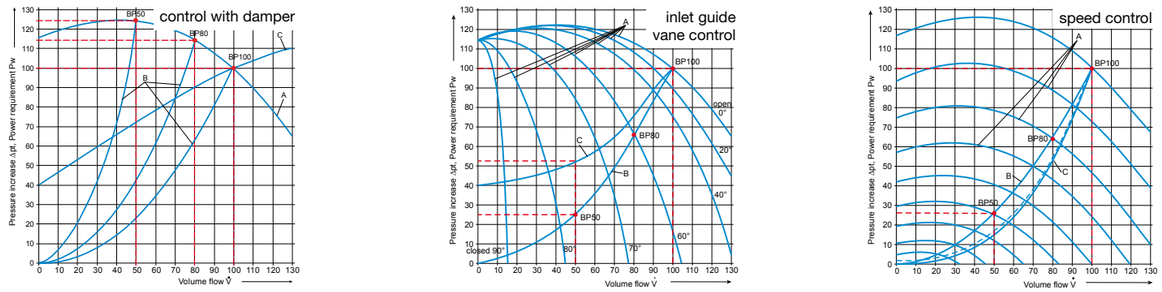
Performance requirement curves
C1 = control with damper
C2 = inlet guide vane control
C3 = speed control

ENERGY SAVING & MORE. ALL ADVANTAGES AT A GLANCE.

A mere glance at the performance requirement curves shows that systems with speed control have considerable energy savings potential in comparison to mechanically controlled fans. But there are some more important arguments for choosing a REITZ' speed controlled fan system compared to other types of controlling.

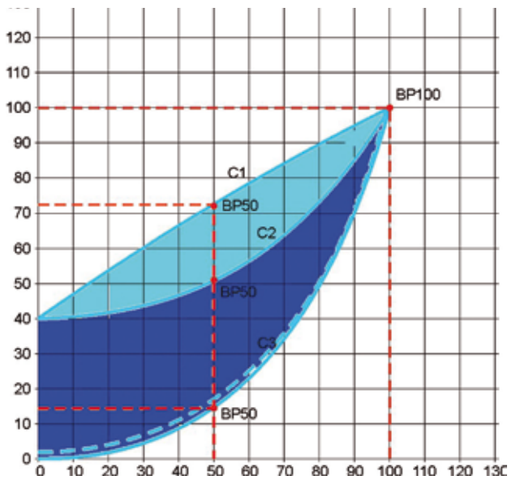
SPEED CONTROL ADVANTAGE 1: 100% AS-NEEDED CONSUMPTION.

In terms of energy efficiency it should go without saying that not more energy is spent for fan operation than actually needed for the optimal sequence of the ventilation process.
What does this mean? The pressure increase in the individual operating points must merely achieve the value that the system requires to produce the volume flow and to overcome the plant's resistance. The optimal efficiency degree is then achieved. In principal, exceeding pressure increases are ineffective.



A = fan performance curve
B = plant performance curve
C = power consumption

The power requirement of three common fan control systems by comparison



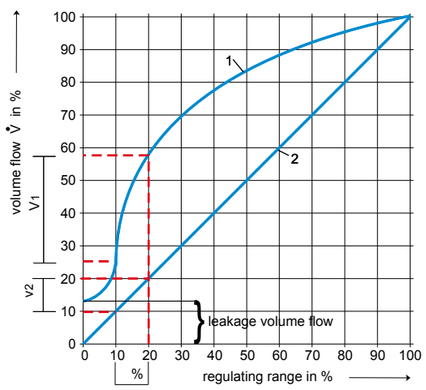
Only systems with speed control achieve the ideal value in each particular case due to their adaptation to the fan performance curve. An exemplary calculation showed considerable energy saving of 71% compared to the inlet guide vane control and of 80.3% compared to control by damper in the operating point 50.

Comparison of the power requirement curves C = Pw in correlation to volume flow in % referred to the design point.
C1 = control by damper / C2 = inlet guide vane control / C3 speed control
C2-C3 energy saving between inlet guide vane control and speed control
C1-C3 energy saving between control by damper and speed control

SPEED CONTROL ADVANTAGE 2: LINEAR CHARACTERISTIC OF THE CONTROL SYSTEM.

Every plant designer or operation company faces a special challenge in the curve characteristics of the control by damper and with inlet guide vane. The combination of a stepwise control with a damper or inlet guide vane, for example, often leads to the following problem: in the partial load range between 25% and 60% of the volume flow rate, a small step of the stepwise control results in a volume flow alteration that is too high. The overriding control system then dictates to take one step back which in turn brings about a volume flow that is too low. In this system, the fan and the stepwise control interact continuously without ever achieving the exact and ideal volume flow.

In contrast, the speed control varies the volume flow linearly to the speed alteration of the fan.



The alteration of the volume flow is often too small or too high when the control is done with damper or inlet guide vane (1), whereas the volume flow changes linearly to the speed when the fan has a variable speed control (2).

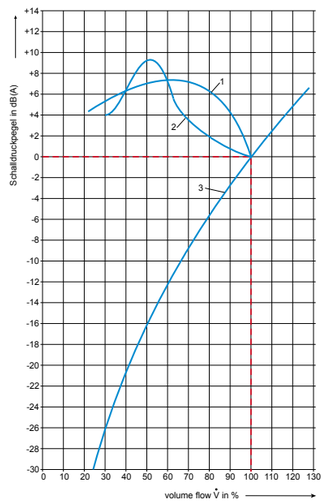
From the global perspective – the energy saving potential of the speed control:

In Germany's trade and industry, the employment of electric drives takes up 220 billions kilowatt hours annually. The usage of speed controlled systems could reduce this figure by 15% to 20% without reducing the production efficiency. The saving potentials for pump systems and fans can even amount to 30%.

SMOOTHNESS & MORE. ALL ADVANTAGES AT AT GLANCE.

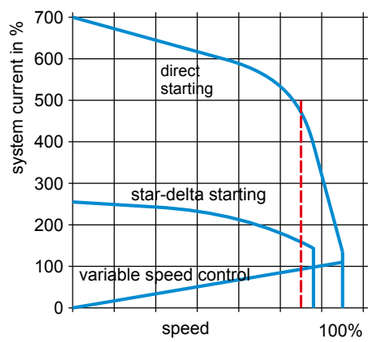
SPEED CONTROL ADVANTAGE 3: QUIET RUNNING.

Active noise and environmental protection also includes avoiding unnecessary sound emissions in all plant components. The favourable noise behaviour alone should induce the operating company to employ fans with speed control. In view of the costs the advantages of the lower noise emissions have to be weighed up against the additional expenses for sound protection measures. Since the speed controlled fan is 9 to 13 dB (A) lower in noise radiation than those with damper or inlet guide vane, the lower or – in some cases – the total expenses for the otherwise necessary sound protection measures may well compensate the additional costs for the speed control.



Alteration of sound pressure level of a radial fan with different control systems

SPEED CONTROL ADVANTAGE 4: PERFECT STARTING BEHAVIOUR.



Motor starting requires a considerably high quantity of energy. High-pressure fans may have a very high mass moment of inertia. If so, much larger motors must be applied than are actually necessary as far as the needed shaft power is concerned. For the start-up of fans that are not speed-controlled, the mains must provide a multiple of the rated motor power for the procedure of starting. When variable speed controls are applied, a preset ramp in the frequency converter prevents that the power consumption rises up to more than 1.1-times the rated motor current, resulting in savings in the low-voltage distribution and cable cross-sections.

When the system´s speed is controlled with a variable speed control (frequency converter) the starting current is considerably reduced. This leads to a reduction in the low-voltage distribution, the main switches, the cable cross-section and hence to considerable cost savings in the long run.

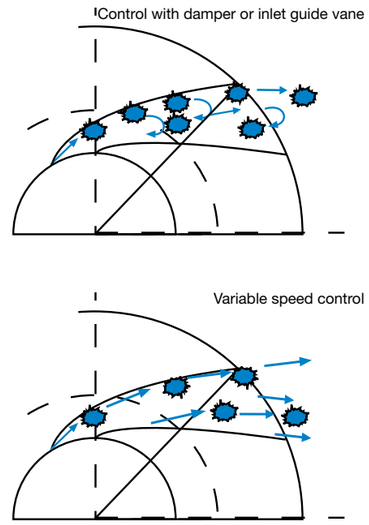
SPEED CONTROL ADVANTAGE 5: MECHANICAL SMOOTHNESS.

Where the smoothness of the machine is concerned, fans with speed control have three decisive advantages over fans that are controlled with dampers or inlet guide vanes.

1. Less stress in the part-load range
In the part load area, speed controlled fans adapt the speed in order to produce the necessary volume flow of handled gas. In contrast to fans that are controlled by inlet guide vane or dampers, pressure variations and excitations of vibrations which in the long run put stress on the rotating parts as well as on the housing and fan components are not to be expected.

2. Less building-up of sticking material by avoiding backflows
If the handled gas contains solid matter like dust, sticking material is likely to build up at the blade side that is exposed to low pressure by backflows in the part-load range. The impellers must then be cleaned in shorter intervals, which results in an increase in shutdowns. In contrast, the reduced speed in the variable speed controlled systems produces a constant flow which neatly conveys all solid matter through the space between the blades.

3. Less wear and tear by reducing the flow velocity in the part-load range



Liability to build up sticking material in the part-load range
By reducing the speed in case of speed controlled systems, all solid matter is conveyed at a constant flow.

SPEED CONTROL ADVANTAGE 6: INTEGRATION IN A REMOTE MONITORING SYSTEM.

System monitoring shows an increasing tendency to group performance parameter of the overall system and to analyse this data on-site or in a remote monitoring centre. A REITZ maintenance contract offers the condition-oriented remote control with the Online Condition Monitoring. When the most important system parameter are constantly monitored and analysed, necessary maintenance activities can be initiated at an early stage and therefore reliably prevent or manage standstill periods. The operational reliability of the overall system is improved.

ORGANISED HARMONY – GUARANTEED BY REITZ VENTILATOREN

All energy efficiency and availability are to no avail when the system components do not match. Over decades, REITZ engineers have done research and development activities on speed controlled systems. We have finally managed to get under control the phenomenon of the undesirable resonance vibrations. Today, all components are tested on the test stand and are integrated in the plant as interface-optimised systems.

INEVITABLE WHEN NOT TUNED. RESONANCE VIBRATIONS IN THE SYSTEM.

Still today, it is common practice to regard the fan, the motor and the frequency converter as single components and not as a unit. They are therefore separately ordered and installed. How unfavourable this approach is, is only recognized when resonance vibrations occur whose origin cannot be exactly determined. The reason for the vibrations lies in the variety of combinations of the most different generated and natural frequencies. The vibrations can only be eliminated when the components are handpicked before and exactly tuned and co-ordinated.

FULL OF GO – BUT NO VIBRATIONS BENCH TESTED QUALITY BY REITZ.

In order to ensure an operation that is almost free from vibrations in accordance with DIN 10816-3 (German Industrial Standard), all speed-controlled fan systems up to 500 kW undergo extensive tuning activities and corresponding setting of parameters in our measuring and test engineering workshop. The adaptation and tuning of the components for fan systems with higher drive powers is done by our expert staff on-site.

WELCOME TO THE CENTRE OF FANPRODUCTION

REITZ Ventilatoren with about 400 employees at the headquarters in Höxter and the subsidiaries is one of Europe's leading suppliers for process fans in heavy industrial design. We have made it our business to develop products that exactly match the intrinsic requirements of the industrial branch and set the standards for effectiveness, operational reliability and energy efficiency.

AT HOME IN THE WORLD'S PLANTS: RELIABILITY BY REITZ.

In the most different designs and dimensions, speed-controlled process fans of REITZ are employed in all process-technique branches. Our fans working in large-scale power plants, in waste incineration plants, in steel and cement works throughout the world merit the trust placed in us and meet the highest demands on performance, capacity and reliability.

DESIGNED FOR A FAVOURABLE BALANCE: ENGINEERING BY REITZ.

Economics already counts in the design stage at Reitz. In this phase the fans are elaborately adapted to the process requirements on the basis of sound knowledge of the procedural basic conditions. The same diligence is applied to the selection of the most energy-efficient solution. The result is the maximum trouble-free and economic operation of the plant with the positive side effect of saving energy and reducing the CO_2 emissions.

ARE YOU INTERESTED IN OPTIMISING YOUR ENERGY EFFICIENCY? NO PROBLEM.

Contact us to arrange a personal appointment.

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We look forward to hearing from you!

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