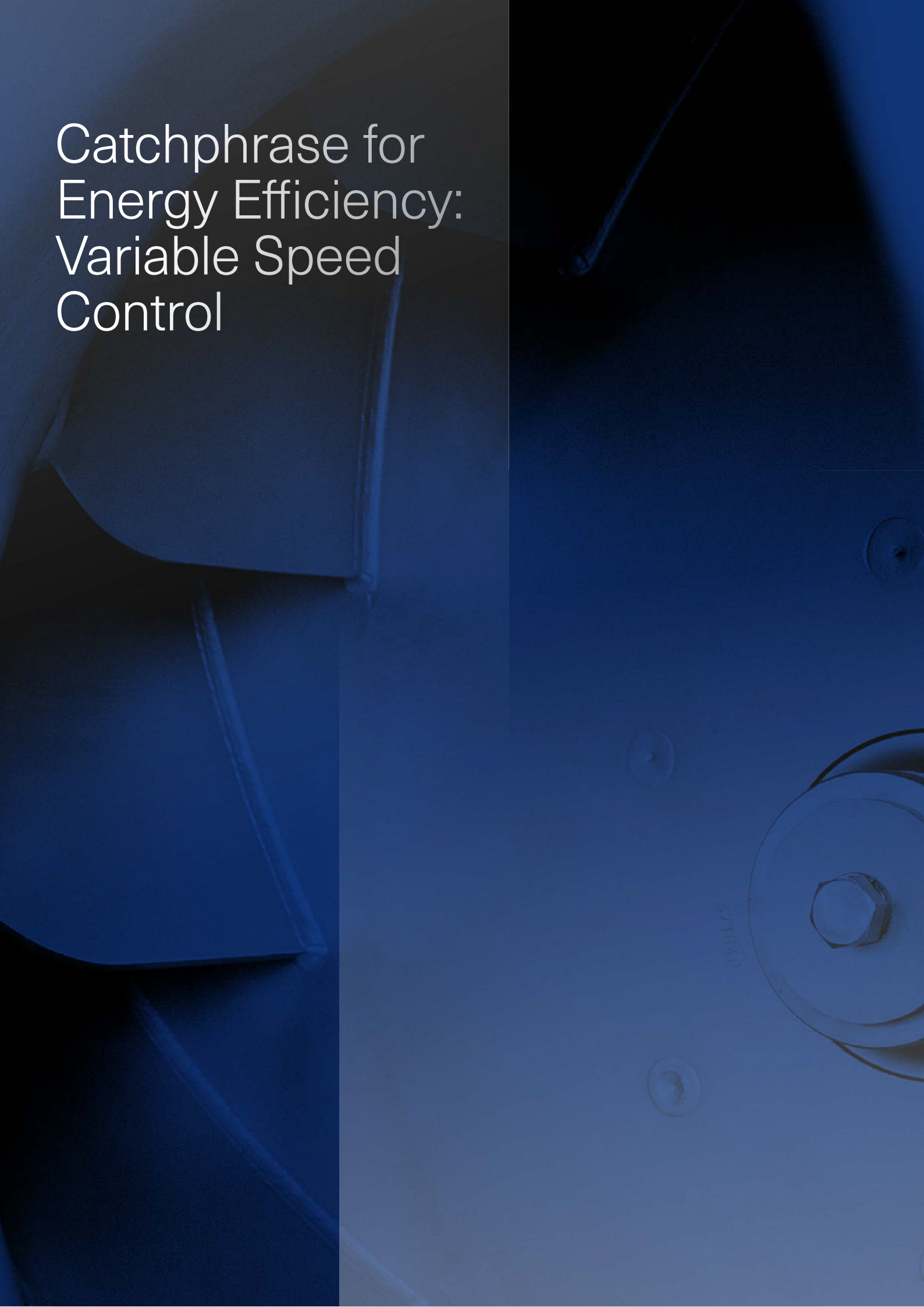


Only as Much  
as Needed

**Variable Speed Control**

# Catchphrase for Energy Efficiency: Variable Speed Control



# Quality is our passion

As an owner-managed family business from one of the most significant engineering regions in Germany, we manufacture radial fans for every conceivable industrial application. We have made it our business to develop products that perfectly **address the needs of specific sectors** and set new standards in terms of **efficiency, availability and energy efficiency**.

**As a globally positioned corporation, we support our customers in every economic region of the world** with engineering made in Germany, uniform product quality and comprehensive services.

Extensive certifications ranging from DIN EN ISO 9001:2015, valid for each of our production locations, to DIN EN ISO 3834-2 for welding technology and many more are lasting proof of this.

**Sustainability and our corporate social responsibility (CSR) are of enormous importance to us**, and we endeavour to do justice to the benchmarks in every area of our company and, of course, far beyond.

Since 2019, we have drawn on the support of EcoVadis, the globally active CSR platform, in this respect. Indeed, EcoVadis awarded us its silver medal last year. This approach has enabled us to continually expand our sustainability and ensure it is part of every business decision.



## At home in plants all over the world: Reitz reliability

REITZ process fans with variable speed control are used in a variety of designs and dimensions in all sectors with process engineering applications. Whether in major power plants, waste incineration plants, steel or cement works, trust placed in Reitz fans is justified all over the world.

With unique diversity, a high level of availability, long service life and stable quality, Reitz has impressed discerning plant manufacturers, planners and manufacturers for decades. The modular design of these fans ensures a maximum degree of configuration freedom and planning security on very attractive terms.

# Catchphrase for energy efficiency: Variable speed control

Taken together, industry and commerce, trade and services consume around 70% of all the electric power in Germany. Industry on its own requires almost half of this, and its power consumption soared in recent decades. It is therefore vital that the potential for electricity savings available in these sectors be harnessed.

A **growing awareness of sustainable action** also means that every business is striving to investigate and optimise all their processes with regard to energy efficiency. For this reason, Reitz process fans with variable speed control represent a pioneering solution to achieve savings in energy and costs that really make an impact.

## Energy efficiency – also a future issue in Europe

EU Directive 2012/27/EU notes the following:

There is a need in the European Union to increase energy efficiency [...].

Improved end-use energy efficiency will also contribute to the lowering of primary energy consumption, the reduction of emissions of CO<sub>2</sub> and other greenhouse gases and, consequently, the prevention of **dangerous climate change**.



# Only as much as needed Speed makes all the difference

The following control technology is employed today in all ventilation systems with a square-law (parabolic) characteristic curve:

## Damper control / Inlet guide vane control

The simplest, but least efficient method is damper control. This involves integration of an adjustable valve in the system which aids in modification of the plant characteristic curve, creating new intersection points with the fan performance curve.

Inlet guide vanes can also be used with radial fans. These are fitted at the inlet and, as intake guides, change the direction of the inlet speed and create a swirling flow at the impeller inlet.

Both mechanical control methods lead to a considerable deterioration in efficiency at the desired operating points.

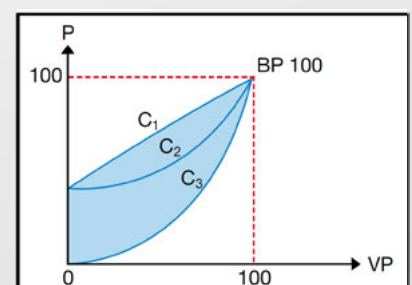
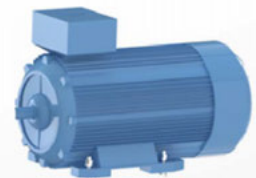
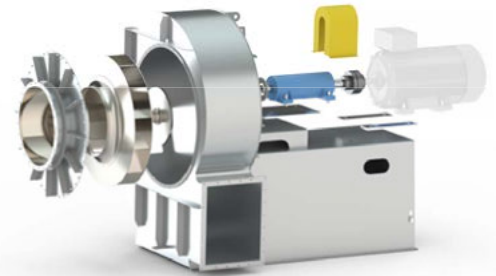
## Variable speed control

The most efficient control method is variable speed control of a fan with the aid of appropriate variable electric drives. The advantage of this method of control is that the fan can always be operated within the most favourable efficiency range. The plant characteristic curve is maintained during this, while the fan curve alters in line with the laws of proportionality.

## 30 per cent less energy input with no efficiency loss.

Reitz fan systems with variable speed control consist of three components: the fan, motor and frequency converter. Precision coordination of these components ensures a maximum degree of energy efficiency.

Additional costs for the variable speed control system amortise on average within two years through savings effects.



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

# Energy saving and more.

## An overview of all variable speed control advantages

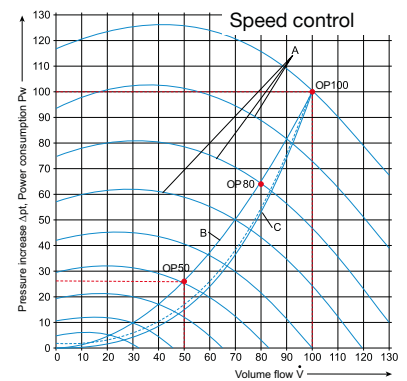
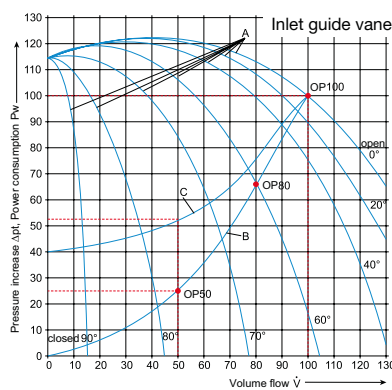
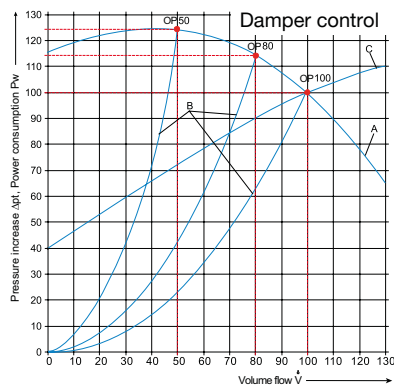
The fact that, when compared to mechanically controlled systems, variable speed control systems offer substantial energy saving potential is evident when one looks at the power requirement curves. However, a comparison of the control methods indicates that other important arguments exist in favour of a variable controlled system from Reitz.

### 100% needs-based consumption

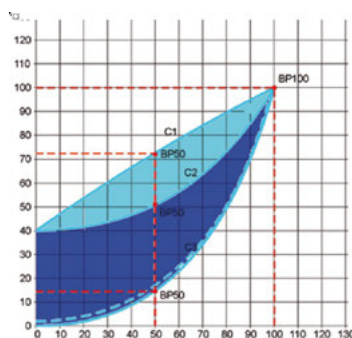
In the context of energy efficiency, it should be evident today that fan operation should use no more energy than required for optimum ventilation process performance. What does that mean? The pressure increase at respective operating points merely needs to

reach the exact resistance value that the system in which the fan is used demands to establish the volume flow. The optimum efficiency level is achieved under these conditions. Every pressure increase that exceeds this is, in principle, inefficient.

### Comparison of power requirement of the three common fan control systems:



- A = fan performance curve
- B = plant characteristic curve
- C = power input



As, due to their alignment with the plant characteristic curve, only systems with variable speed control achieve the optimum value each time, significant energy savings of 71% when compared to inlet guide vane control and 80.3% when compared to damper control are recorded at operating point 50 in an example calculation.

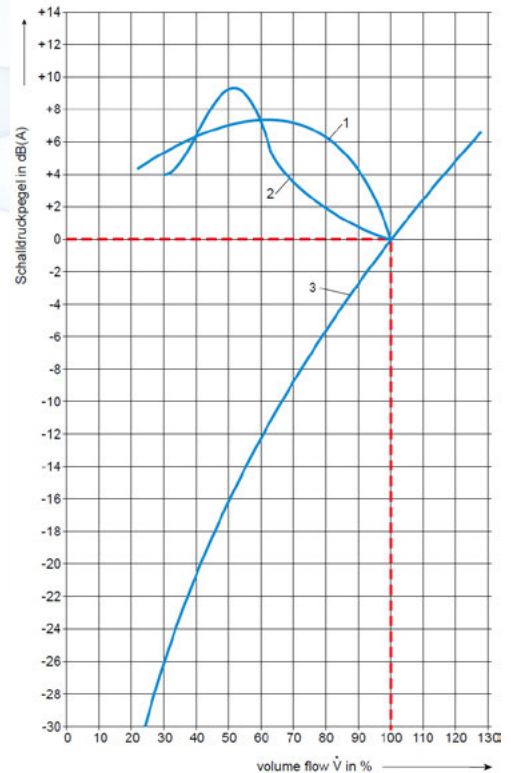
Comparison of fan power requirement curve  
 C = Pw plotted over the volume flow in % relative to the design point.  
 C1 = damper control | C2 = inlet guide vane control | C3 = variable speed control  
 C2 - C3 energy saving between inlet guide vane and variable speed control  
 C1 - C3 energy saving between damper and variable speed control

# Smooth running and more. An overview of all variable speed control advantages

## Quiet running

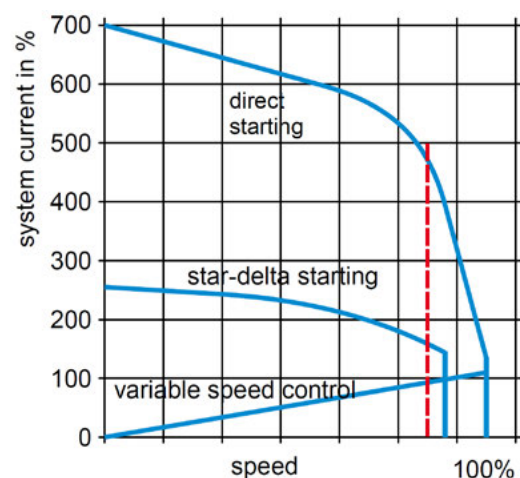
Active noise and environmental protection also means avoiding unnecessary noise emissions in all system components. Along the consideration of more favourable noise behaviour means that the choice should favour fans with variable speed control.

In terms of the costs involved, the noise advantages of variable speed control must be weighed up against the additional expense of sound insulation measures. As a fan with variable speed control is, overall, between 9 and 13 dB(A) quieter during partial load operation than with damper and inlet guide vane control, the additional costs for a variable speed control system can in many cases be offset by the lower expense for or, in individual cases, even the elimination of noise protection measures otherwise required.



Radial fan sound pressure level changes in different control systems.

## Perfect start-up behaviour



Minimising of the starting current in variable speed control systems by the frequency converter facilitates smaller dimensioning of drive components and, therefore, considerable cost savings in the long term.

The start-up procedure is a not insignificant energy consumer. The mass moment of inertia can be very high in the case of fans. It is then necessary to use motors with a drive power greater than would be needed relative to the required shaft power. When starting fans without variable speed control, the mains supply for the start-up procedure needs to provide power that is many times the rated motor current. Where frequency converters are used, power consumption that exceeds the rated motor current 1.1 times is avoided through a preset current ramp in the frequency converter. This results in savings associated with voltage distribution and cable cross sections.

# Mechanical smoothness

With regard to smooth running, systems with variable speed control offer two decisive advantages over inlet guide vane and damper control fans:

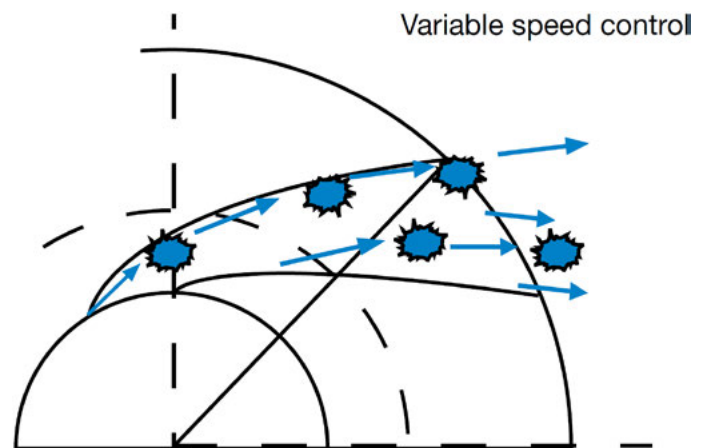
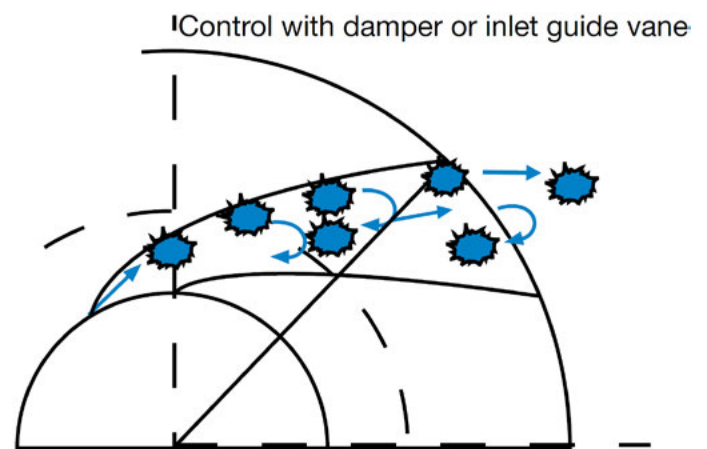
## 1. Low stress in partial load range

Inlet guide vane and damper controlled fans also run at full speed in the partial load range. The volumetric flow of handled gas that is not required is more or less simply shut off. This then leads to pressure deviations and vibration excitation that stress the rotating components, housing and control elements in the long run.

## 2. Less material build-ups through avoidance of backflows

If the gas handled contains solids such as dust, backflows in the partial load range increase the risk of material sticking to the suction side of the blades. Impellers need to be cleaned more frequently and downtimes increase as a result. On the other hand, reducing the speed in the variable speed control system generates a more even flow that conveys all particles cleanly out of the space between the blades.

## 3. Lower wear through reduction of flow speed in partial load range



**Material build-up behaviour in partial load range**  
All solids are conveyed away in the case of variable speed control by a uniform flow achieved through speed reduction.

## The global picture – energy saving potential through variable speed control:

Industry and commerce in Germany consume 220 billion kilowatt hours per annum through applications with electric motors. 15% to 20% could be saved through variable speed control without reducing the level of production. Pumps and fans even conceal potential savings of up to 30%.





## Designed for a positive balance sheet: Engineering from Reitz

Efficiency begins for us during the planning phase. Fans are adapted in detail to process requirements during this phase based on sound knowledge of basic process engineering conditions. The same diligence and care is given to selection of the most energy efficient solution. The result is operation of the plant with maximum efficiency and as free of malfunctions as possible, with the positive side effect of saving energy and contributing to a reduction of CO<sub>2</sub> emissions.

## High momentum, zero vibration: Test bench quality from Reitz

It is still usual in some cases today to consider, order and install the fan, motor and frequency converter as individual components. Problems with this approach exhibit themselves at the latest with the occurrence of vibration that cannot be localised. The cause lies in a combination of varied excitation and natural vibration which can only be eliminated through careful selection of components in advance and comprehensive tuning.

Decades of development work on variable speed control systems have enabled us to systematically control the phenomenon of undesired resonance vibration. To guarantee operation free from vibration conforming to DIN 10816-3, comprehensive tuning and appropriate parameterising are realised in our own measurement technology facility for all variable speed control fan systems up to 1000 kW. In the case of fan systems with greater drive power, tuning of components is realised on-site at the location by experienced Reitz specialists.

# Reitz service: Always working for you

The demands made of our fans differ from plant to plant, meaning specific expertise is required for each application area. At Reitz, you are talking to **specialists who are familiar with the special aspects of your sector**, because your details make all the difference.

We are, of course, immediately there to help when problems arise, but service for us is much more than tackling emergencies, maintenance of the fan or the provision of spare parts. For us, service is a **holistic range of services at every phase of a project**.

## Service in all phases

### Sales phase

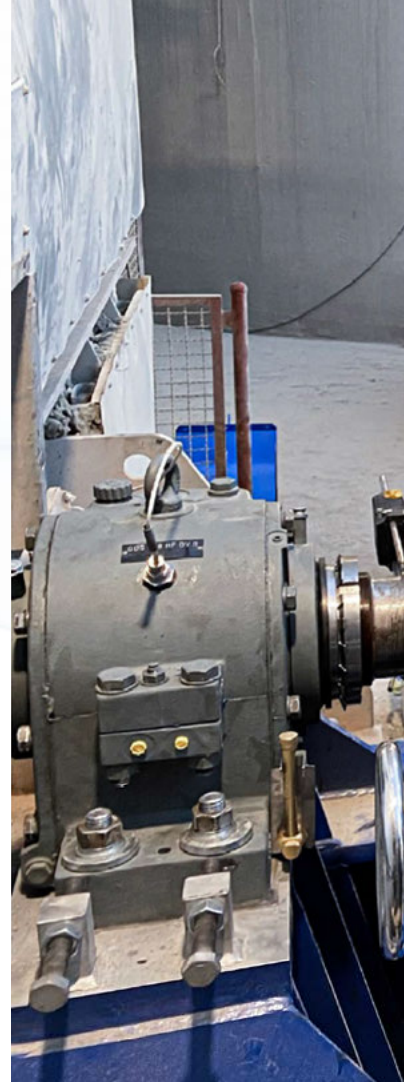
Optimum planning and smooth implementation right up to a successful start.

### Utilisation phase

A high degree of availability, predictable expenses and reliable output.

### Value retention

Contemporary extension of service life.



## Your challenges



### Revenue

Efficient operation of plant and equipment



### Legal

Meeting all statutory requirements in terms of operator responsibility  
- Ordinance on Industrial Safety and Health, hazard analysis and ATEX directive



### Process

Meeting qualitative requirements with limited resources  
- Individual maintenance concept



### Environment

Equal attention to economics and ecology  
- Assuring productivity and energy efficiency



## What do we contribute?

- Specific quality promises
- A guarantee
- Flexibility and speed
- Efficient solutions through comprehensive know-how
- Planning security
- Certified technicians
- Global partnership

## Our service offer

### Base

- Customer support
  - Reliable & uncomplicated
- Fault elimination
- Spare parts sales
- Repairs
  - Factory or on site

### Maintenance

- Basic inspection
- In-depth inspections
  - Impeller, welds, bearings
- Maintenance and repair
- Measurements on fan
  - Vibration, noise, power
- Laser-optical drive train alignment



### Consulting

- A firm maintenance offer for own systems and other manufacturers
- Strengthening and conversion
- Industrial and heavy installations in adjacent areas (e.g. flow control)
- Complete plant retrofits

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