

Large and Special Fans



At the pulse of industry ...

Large and special fans from Venti Oelde are used in almost all key industries. They are the “heart” of industrial plants and processes, as they are mostly in use around the clock, for example in the cement and steel industries as well as in the chemical industry and refining plants, in



power stations and waste incineration plants. Other areas of application are the mining, food, glass and woodworking industries, to name just a few.

Absolute reliability is required in all areas. Venti Oelde guarantees this through technical competence and recognized quality. Our services range from planning and engineering through distribution and installation to maintenance and after-sales service.

All individual solutions for the complex performance profiles are primarily based on functionality, reliability and operating and economic efficiency. As a “problem solver” with technical far-sightedness, our medium-sized enterprise has the backing of decades of experience and success in the market.



Venti Oelde develops and optimizes individually designed partial and complete solutions for almost all industrial air handling applications. Large and special fans from Venti Oelde are unique systems with the best possible efficiency and maximum availability.



The various series and types, their specific material combinations and whole range of performance levels, are designed to satisfy the precise needs of each individual industry and its areas of application. The performance profiles for large and special fans differ greatly according to the industrial sector. Sometimes a particularly high temperature stability is needed, elsewhere the greatest possible resistance to corrosion may be required. Other times, maximum resistance to wear or the smoothest possible running has the greatest priority in the performance profile. Thus, the various demands require indi-

vidual engineering and precise custom-engineered solutions.

Sound-proofing, the elimination of structure-borne noise, corrosion resistance, gas-tight versions, minimal dust deposits and countless other specifications are the challenges that Venti Oelde is daily confronted with anew, enabling us to align the process engineering variables to the respective needs of our customers.

Venti Oelde plans and produces not only large and special fans, but also components and systems. We test

and deliver our systems and put them into operation ready to use. Furthermore, if requested, we can control them with telediagnosics, measure and maintain them and keep them in working order. If required, Venti Oelde also repairs and optimizes plants of other manufacturers and makes them fit for increasing demands.



Comprehensive range of services ...



As a system provider, Venti Oelde is well versed in the processes of individual branches. Our services are therefore always targeted to completely integrated process solutions in which all components functionally engage. In this respect, we concentrate on details as early as the quotation phase. The specific regulations of individual industries and environmental and technical conditions, e.g. noise control, are taken into consideration from the start.

All large and special fans, together with their connecting and adapting fittings, are planned and calculated by

Venti Oelde for long-term operation under extreme conditions.

Our Research and Development department works with state-of-the-art measuring technology and ultramodern laboratory analyses and testing methods. To begin with, noise levels are determined, the strength and heat resistance of materials are tested and flow technology influences on the components are examined. Automation, calculation according to the Finite Element Method, 3-D computer simulations and performance tests in the lab serve as the basis for opti-

mization and new conceptions. Our modern manufacturing facilities produce to the highest quality level.

Individual engineering, thorough research and on-going development of technical solutions make Venti Oelde a recognized partner for international customers.



The outstanding quality of Venti Oelde large and special fans is not a random result. It is the consequence of a whole series of reliable quality assurance systems.

The Venti Oelde production standards comply with all the necessary German and international standards. We carry out continual quality control throughout the production process, after final assembly in the factory as well as on site at the customer's, in compliance with international guidelines DIN EN ISO 9001:2015, the European Product and Operating Guidelines for Explosion Protection



in accordance with ATEX and the European standards for the welding of pressure vessels and steel structural components.

The outstanding quality of our services is also ensured by the know-how and commitment of the whole workforce, by regular further training and exemplary customer relations – from consultation to aftersales service.

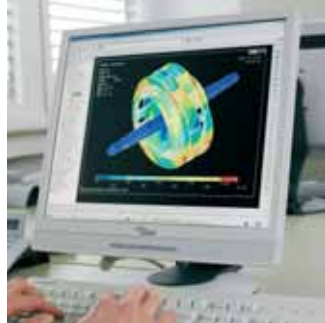
Qualified advisers in the field and in the office assist customers and prospective customers during the whole transaction, to simplify the way for them from the original inquiry

through the drawing up of the specifications, right up to the in-situ operation. For customers there is always someone available at Venti Oelde who is knowledgeable in his field and has the backing of an experienced team of top-class specialists.

Even after the delivery and installation, Venti Oelde explicitly remains a partner for our customers and can be reached by them day and night.

Quality work ...

The flow technology and mechanics of our large fans are well-engineered right down to the last detail. They are individually planned and designed for your application by our specialists for long-term reliability. Only then do our trained and experienced specialist workers produce the optimal fan for you with modern production engineering and practiced, unique manual work. Follow us through the most important stages from the calculation to acceptance or delivery.



FEM Computation of a rotor



Construction of a welded impeller

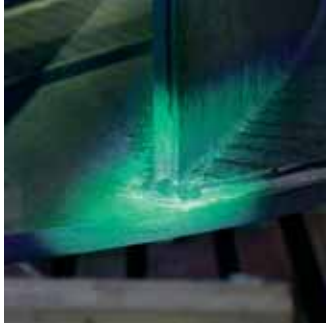


Production of a casing component

Manufacture of an impeller shroud up to 4.50 m by our stretch-forming machine

Laser cutting in the sheet metal work centre





Final inspection of an impeller by our quality assurance



Balancing a rotor unit



Final inspection prior to delivery

Final machining of a forged flanged shaft and a finished welded impeller



Test assembly of a double-flow centrifugal fan



Rotor unit, ready for dispatch in a transport frame



Quality inspection after completion of each individual production step



In use in the cement industry

Venti Oelde is one of the world's leading providers of large and special fans for the cement, lime and gypsum industries. They are in use throughout the complete production process chain, from firing and cooling, grinding and separating to dust removal. Our fans work under arduous conditions, fulfilling various functions, depending on their operating point and application.

The large fans are confronted with acceleration and centrifugal forces of varying strength, as well as with vibrations of differing strength and direction. They must withstand changes in temperature as well as corrosive media attacks and abrasive dust and also fulfil the regulations for noise control.

Venti Oelde engineers are acquainted with the complete production process. They select suitable materials for the individual components, dimension them according to the application and adjust them to each other. Reliable wear prevention, high efficiency and long service lives are the main objectives of our planning and production.

When grinding cement, coal and raw materials, the main focus of fan technology is on wear prevention as well as energy efficiency. With separating, variable regulation of the amount of air is one of the decisive factors.





With cooler exhaust air, wear is generally to be prevented and heat-resistance assured.

With heat exchanger fans, caking is to be avoided and exceptional heat-resistance ensured. By adaptation of the blade geometry, caking is minimized, maintenance work is reduced and a long service life guaranteed.

For combustion air, Venti Oelde supplies two-stage centrifugal fans with up to 400 kW drive power. Modern burners with pressure ranges of between 250 and 400 mbar are thus made even more effective. In addition, the compact, centrally arranged drive saves space and cost.



For the cooling of rotary kiln jackets, swivel-mounted axial blowers force air against the outer surfaces. They can be either permanently installed or set up to be manoeuvrable.



When dedusting furnaces and coal, tube and cement mills, as well as clinker coolers, the evacuation of particles is ultimately the main focus. Fans behind bag filters or electrostatic precipitators convey large flow volumes at relatively low differential pressures.

Extreme performances for the steel industry



Large fans are indispensable in the steel industry. They perform untiringly in sinter, pellet, dust removal and gas cleaning plants, in furnaces, pickling and direct reduction plants. Conveying fans, process and exhaust gas fans as well as ventilating fans, transport enormous amounts of dust, move tremendous masses of air and handle dangerous gases.

The demands on technology, material and mechanics are complex. Venti Oelde responds to this with individual designs, precise construction and high-quality production. In this way, we create each plant individually – for first-rate performance and reliable operation. We produce new plants and modernize existing ones. Our “upgrades” increase performance, optimize the process and save energy.

When using large fans, the interfaces to the plant are of decisive importance. Venti Oelde therefore provides, on request, the complete engineering with reliable pressure calculation and optimally designed ducting.

For long service life and trouble-free operation, Venti Oelde large fans are frequently equipped with journal bearings. In addition, they have a special blade construction. Caking of sticky dusts can be reduced by the use of water injection, for example.





Sometimes, the peripheral speed of large fans approaches the limit of what is physically possible. Venti Oelde has tested the temperature-dependent strength and yield points of materials for many years. Reference values have been established and our own safety standards introduced. We plan, dimension and manufacture fans for permanently high demands on the basis of FEM computation.

Our circulation blowers can withstand temperatures of up to 1,000°C and are used for tempering, annealing and hardening furnaces, as well



as for core drying. We adjust their speed to the requirement at the particular operating point.

For sinter plants, Venti Oelde produces cooling-air fans that can transport 2.3 million cubic metres of fresh air per hour through the cooling chamber.

When toxic or explosive gases, such as converter gases containing carbon monoxide, are conveyed, the opening where the shaft passes through the fan casing must be absolutely gas-tight. Multi-chamber labyrinth seals with sealing gas connection provide the safety required here.

Hydrochloric acid is used in pickling plants to descale steel plates. Our corrosion-resistant roasting gas fans lead off aggressive acid vapours. The inside of the fan casing is lined with extremely resistant hard rubber, the impellers are made of titanium.

Tireless in chemical plants and refineries

There is a multitude of different tasks for Venti Oelde centrifugal fans in chemical plants and refineries. They are needed in methanol production, in fertilizer production and in the gasification of oil, coal and residues. They also provide their untiring services in coke plants and pharmaceutical engineering. Plant constructors and operators worldwide are among those who have been our customers for many years.

Our centrifugal fans are often in use 365 days a year in arduous and hostile areas. These fans can be so equipped, that they even withstand sandstorms and snowstorms, high humidity and temperatures down to minus 50°C. Our fans run for years under adverse conditions – with high availability and energy efficiency and to the complete satisfaction of our customers.

Together with the fans, we deliver the requested equipment such as variable inlet guide vanes or dampers with drives, inlet boxes, flexible joints, silencers, ductwork and blow-off systems, as well as filters and vibration dampers. We attain optimum performance coupled with maximum availability of the plant by suiting these components exactly to the needs of our customers.





The dependable quality of our fans and systems is based on on-going technological development, high-grade materials, perfect workmanship and tried and trusted components from other manufacturers. If required, centrifugal fans can comply with the strict American Petroleum Institute Standards API 560 and 673.

For manufacturing, we use high-grade materials such as carbon steel, high-grade steel and special-purpose alloys. In addition, we equip our fans with bearings from well-known manufacturers and also use external oil feed plants for the lubrication of bearings and drives. On request, the oil feed plants can comply with the API 614 Standard.

The quality demands we make on material correlates with the high-quality of our processing. Shaft seals are designed individually to work under the specific conditions of use – if necessary we use multi-chamber labyrinth seals with sealing gas connection.

Our fans are mostly driven by electric motors, less often with steam turbines, but also by a combination of the two. On request, we equip our fans with electronic control systems from well-known manufacturers for the monitoring of rotating components.

Indispensable in power stations and waste incinerators



Air is required for combustion processes in power stations and waste incinerator plants as well as in the utilization of secondary raw materials. Conventional grate firing needs large amounts of air at low pressure. Modern fluidized bed combustion systems need moderate amounts of air at a high pressure of up to 200 mbar. The air must be perfectly dosed and be available more or less at the press of a button.

Venti Oelde large and special fans provide adequate amounts of primary and secondary air. A precise speed controller quickly adjusts their performance to the optimal operating point and so controls the combustion process. The exhaust air, laden with dust, gases and pollutants, is drawn off by flue gas fans.

Our system solutions ensure high operational reliability, maximum performance and optimal efficiency. We produce temperature resistant fan components from high-temperature resistant and heat-stable steels as well as from nickel-based alloys. Corrosive attacks are warded off with rust-proof chrome steels or hard-rubber coated components. When outside conditions are aggressive, e. g. there is an increased acid concentration in the atmosphere, then we produce our fans completely from special-purpose materials.

We offer automatic controls, such as bearing temperature and vibration monitors, for fast recognition of any operational faults.



In the primary air area, our induced draught fans serve scrubbers, dust collectors, heat exchangers and desulphurization plants. Venti Oelde adapts their design and performance to the technical requirements of the plant.



Our primary air fans transport more than 500,000 cubic metres of air per hour and work at speeds of up to 1,800 rpm. This equates to peripheral speeds of more than 150 m/s. To reach perfect running quality, however, we use special bearings. Of course, the rotors in our machines are dynamically balanced to category G 2.5 for such demanding operating conditions.

Our pyrolytic gas or recirculating fans are at home in the secondary air area. They switch themselves on when required as soon as the flue gas composition changes, whether during start-up or shut-down or because of the current fuel composition.

Our fans transport gas direct from the boiler, compress it and pass the flue gas back to the combustion process. This brings about a decrease in the nitric oxide concentration so that the demanded emission levels can be maintained. For the subsequent flue gas conveyance, we make the fan shaft seals gas-tight with multi-chamber labyrinth seals.

Individual custom-engineered designs

The construction variants and special solutions are manifold, because the made-to-measure configuration of our fans and plants make for maximum efficiency in process engineering.

Venti Oelde also optimizes existing fans and their altered peripheral systems. We adapt them to suit changes in processes and increased demands. The long running times of our fans ensure effective operation of our customers plants. We offer such a service both for our own fans and systems, and for those of other manufacturers.

Service-specific and economically reliable individual solutions are our speciality. The range they cover can be best illustrated by a few examples.

In pre-stressed glass plants in the glass industry, our specialist fans generate short-term very high pressure depending on the glass thickness. The acceleration and braking of the impellers generate high dynamic loads. We use FEM analysis to determine the fatigue strength required. Our specifically developed design programme for couplings and bearings guarantees high operational reliability.

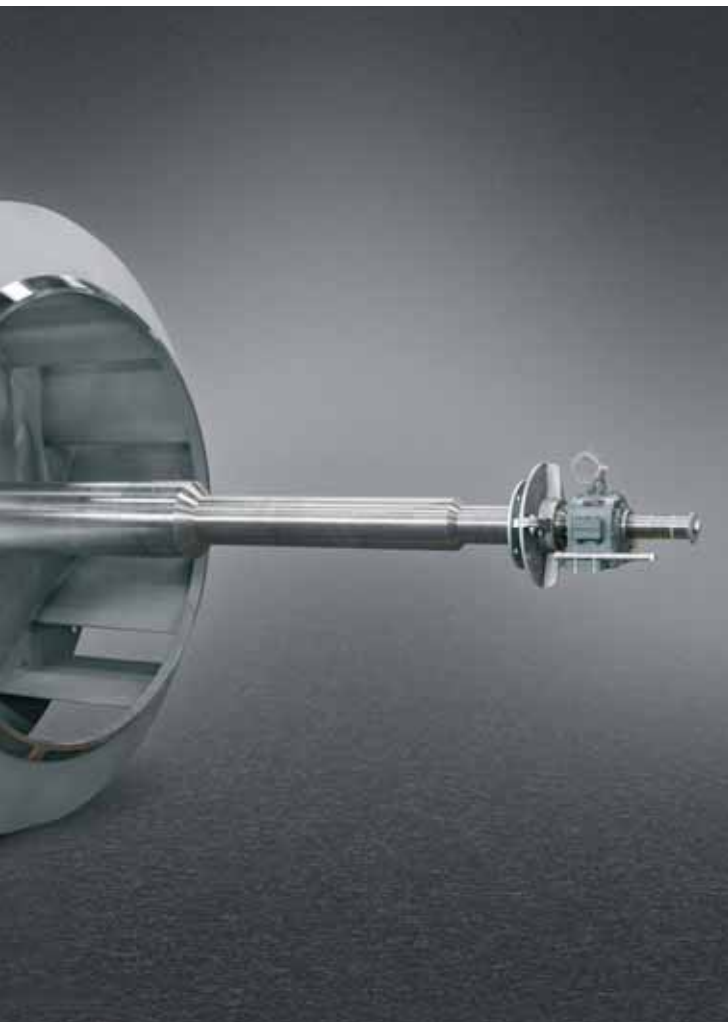
Our corrosion-resistant fans are also put to use in the food industry. Here we use stainless steel or special coatings.

Greatest attention is often focused on wear protection, e. g. in wood chip drying for the production of MDF and HDF boards.

Where heavy oil or substitute fuels are used to provide energy, we prevent corrosive attacks, amongst other things, with acid and rust resistant chrome steels.



Stand-by fans with internal combustion engines are put to work in critical production areas. Should the power supply to the main fan fail, then the stand-by fan ensures the production process. We integrate this fan in the process control system via an automatic starting device.



Our two-stage, high-performance centrifugal fans generate a negative pressure of up to 600 mbar in non-woven production, for instance. We equip these fans with journal bearings and separate oil feeds.



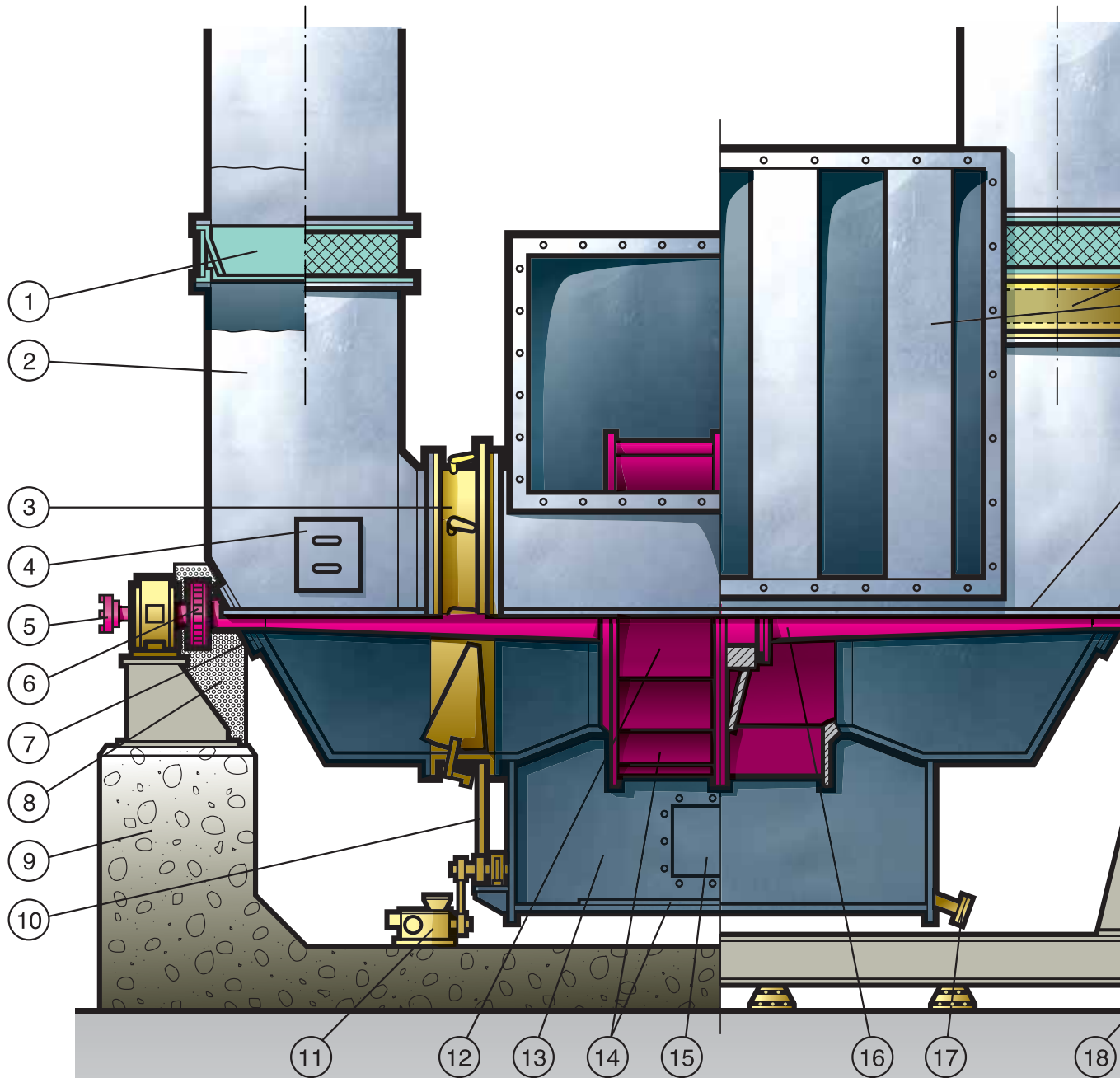
A further speciality is our shock-resistant large fan for shredder plants. Appropriate pressure venting devices are incorporated both in the casing and in the impeller to act against pressure shocks of up to 3 bar.



We equip fans that convey hot exhaust air with heat insulation that simultaneously acts as a sound isolation. The insulation is designed to meet customer-specific requirements with regard to surface temperature and noise level.

In many applications, e.g. for conveying of fresh air or clean-gas side process air, fans with profiled impeller blades are recommended. Their design is comparable with the wing of an aeroplane and the advantages of that are clear: Better flow guidance, higher efficiency and therefore lower energy consumption. A further benefit is the reduction in noise level by up to 10 dB in the optimum of the characteristic zone. Cost intensive noise protection measures are often no longer necessary.

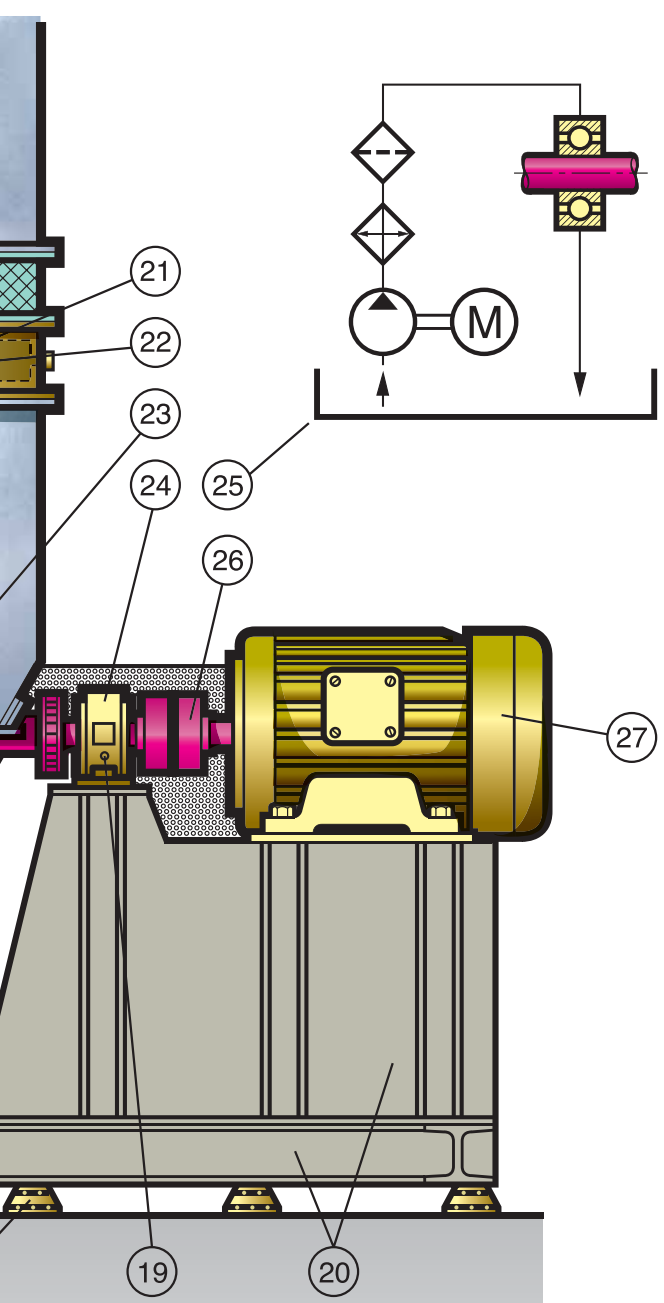
Design and set-up variations



- ① Flexible joint
- ② Inlet box
- ③ Inlet vane control
- ④ Access door
- ⑤ Optional turning gear
- ⑥ Cooling impeller
- ⑦ Shaft seal
- ⑧ Guard

- ⑨ Raised concrete foundation
- ⑩ Adjusting rods for vane control
- ⑪ Actuator for vane control (electric or pneumatic)
- ⑫ Impeller
- ⑬ Fan casing
- ⑭ Lining, e.g. wear protection, rubber lining, coating process säkaphen

- ⑮ Access door
- ⑯ Shaft
- ⑰ Condensate drain
- ⑱ Vibration damper
- ⑲ Bearing monitor, temperature, vibration, shock pulses
- ⑳ Base frame and motor pedestal
- ㉑ Louver damper



- 22 Splitter silencer
- 23 Joint for volute casing and inlet box
- 24 Bearing. Lubricant: Grease, oil (with oil flow ring)
- 25 Circulating oil lubrication
- 26 Flexible coupling
- 27 Drive motor

This representation of a centrifugal fan shows various constructional solutions that can be used, depending on the application.

With double-inlet centrifugal fans, the medium handled enters via inlet boxes that are flange-mounted to the fan inlet side or are directly welded to the volute casing.

Variable speed drive motors, louver dampers or inlet vane controls lend themselves to adapt the amount of gas to the needs of the connected system.

Anchoring directly to the raised concrete foundation is particularly beneficial when, due to operating conditions, imbalance in the rotor is to be expected.

Vibration dampers, together with flexible joints, ensure decoupling between the fan and connected systems.

The efficient operation of fans is based on their operational reliability and availability. Inspection doors allow us to carry out control and maintenance work on the installed rotor. The divided or segment-

ed construction of a casing allows the complete rotor, i. e. both impeller and drive shaft, to be removed with only partial dismantling.

Lining the volute casing and impeller with wear-resistant material results in the considerably lengthened service life of fans that convey media laden with solids.

Sealing the opening where the shaft passes through the casing prevents dust from escaping and protects the bearing from contamination. When hot gases are conveyed, cooling impellers between the casing and bearing ensure the removal of retained and creeping heat. In critical cases, additional oil-circulating lubrication improves bearing cooling.

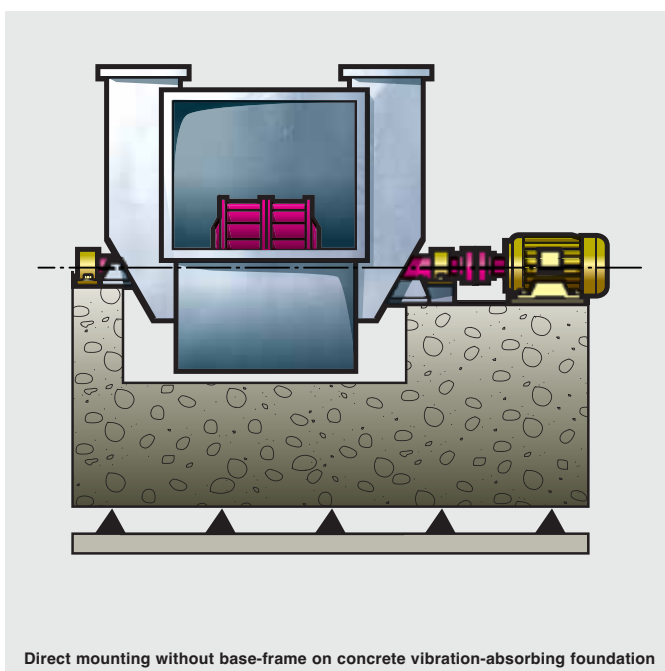
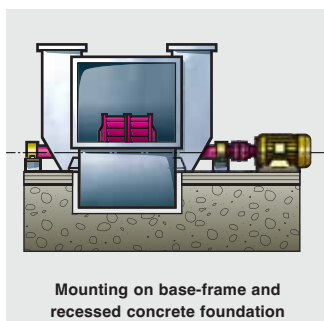
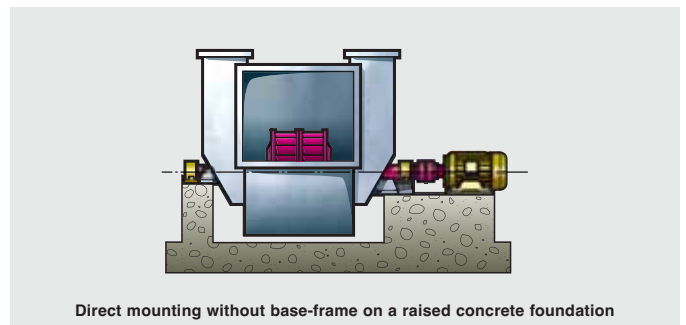
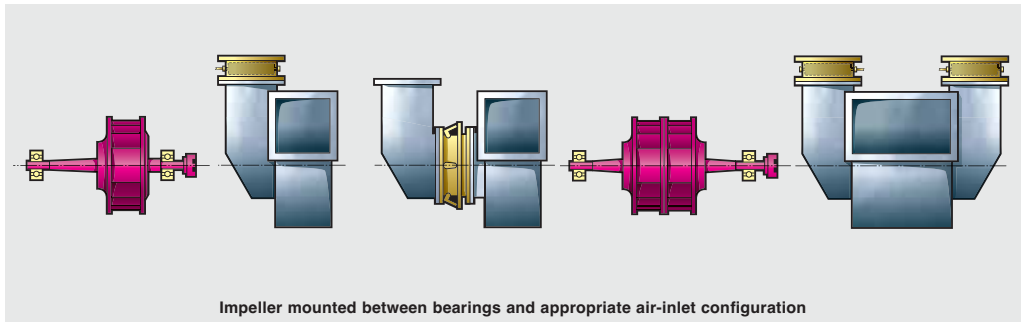
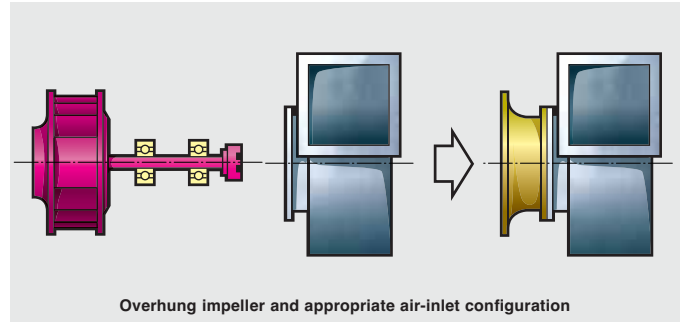
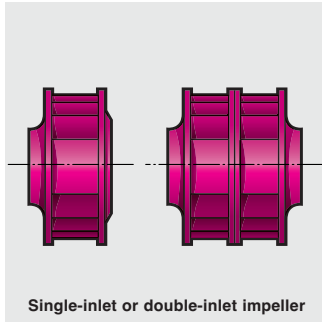
We use splitter silencers, housing insulation or sound-proofing enclosures to bring the fan noise to a level that fulfils legal demands.

Design, mounting and ...

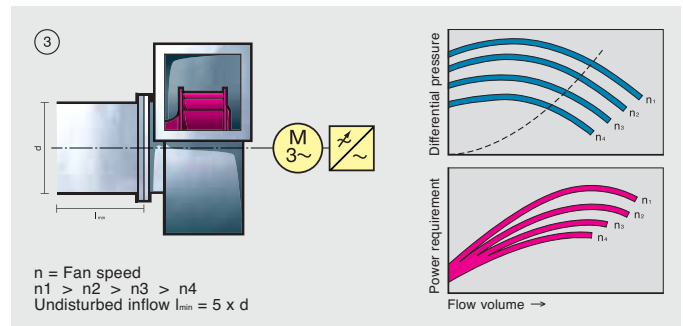
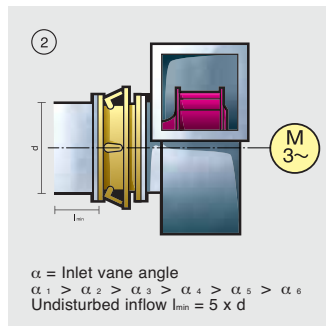
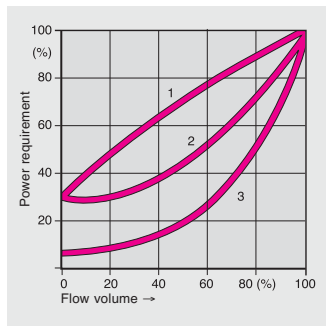
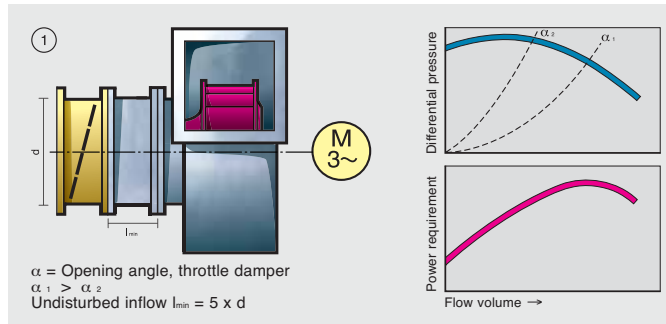
Depending on the operating data, we construct our centrifugal fans with either single or double inlet, i.e. single-width or double-width. On the basis of the geometry, masses, speed and the expected load on the rotor, we determine, together with our customers, if the impeller is to be overhung or mounted between bearings.

The suction of a fan with overhung rotor is brought about via a flanged duct or a shaped inlet, possibly with the interconnection of a throttling element.

Air flows onto rotors mounted between bearings via inlet boxes. The throttling elements are arranged as multibladed louver dampers in front of the inlet boxes or inlet vane controls behind the inlet boxes.

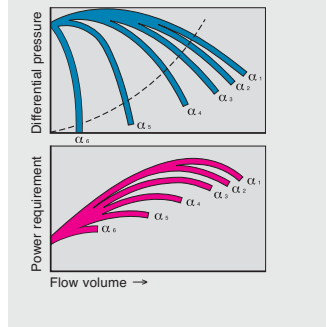


The mounting of large fans on a concrete foundation guarantees high torsional rigidity and negates the need for a welded motor pedestal. Recessed foundations or raised concrete foundations are suitable. On request, we can almost completely eliminate dynamic interactions between fan and base by fitting vibration dampers between them.



Comparison of control methods

Fans used in process engineering plants almost always run in the partial load range, but even for operating points that differ from the design point, they should run with the best possible efficiency. A comparison of control methods substantiates that, with regard to the energy requirement, simple throttle dampers are the least efficient. Control with multibladed louver dampers is more effective and inlet vane controls provide even better results. Optimal control is, however, without doubt, attained by speed control. This particularly low-loss control drastically reduces operating costs, and investment costs are relatively quickly recovered – particularly with fans that are in permanent operation.



① Throttle damper control

Throttle dampers are cost-favourable but high-loss control elements. Throttling displaces the fan operating point to a working point of considerably lower efficiency. The use of throttle dampers is not recommended for high drive outputs and longer lasting partial load operation.

② Inlet vane control and louver dampers

Inlet vane controls and multibladed louver dampers are frequently used to control the flow volume of fans. Their vanes are adjustable. This induces a spin in the gas flow which counteracts impact energy loss in the impeller. Energy consumption is thus reduced in comparison with that for throttle damper control. With double-inlet fans, multibladed louver dampers are usually used in place of inlet vane controls to reduce the distance between bearings and the accompanying costs. Extreme throttling with vane opening angles greater than 60 degrees leads to increased vibration of the machine and should be avoided.

③ Speed control

Speed control always provides the optimal flow volume with regard to operating mode and energy consumption. The fan operates as a matter of principle at higher efficiency. Mechanical stress and wear on rotors subject to a dust-laden gas flow in partial load operation are distinctly reduced.

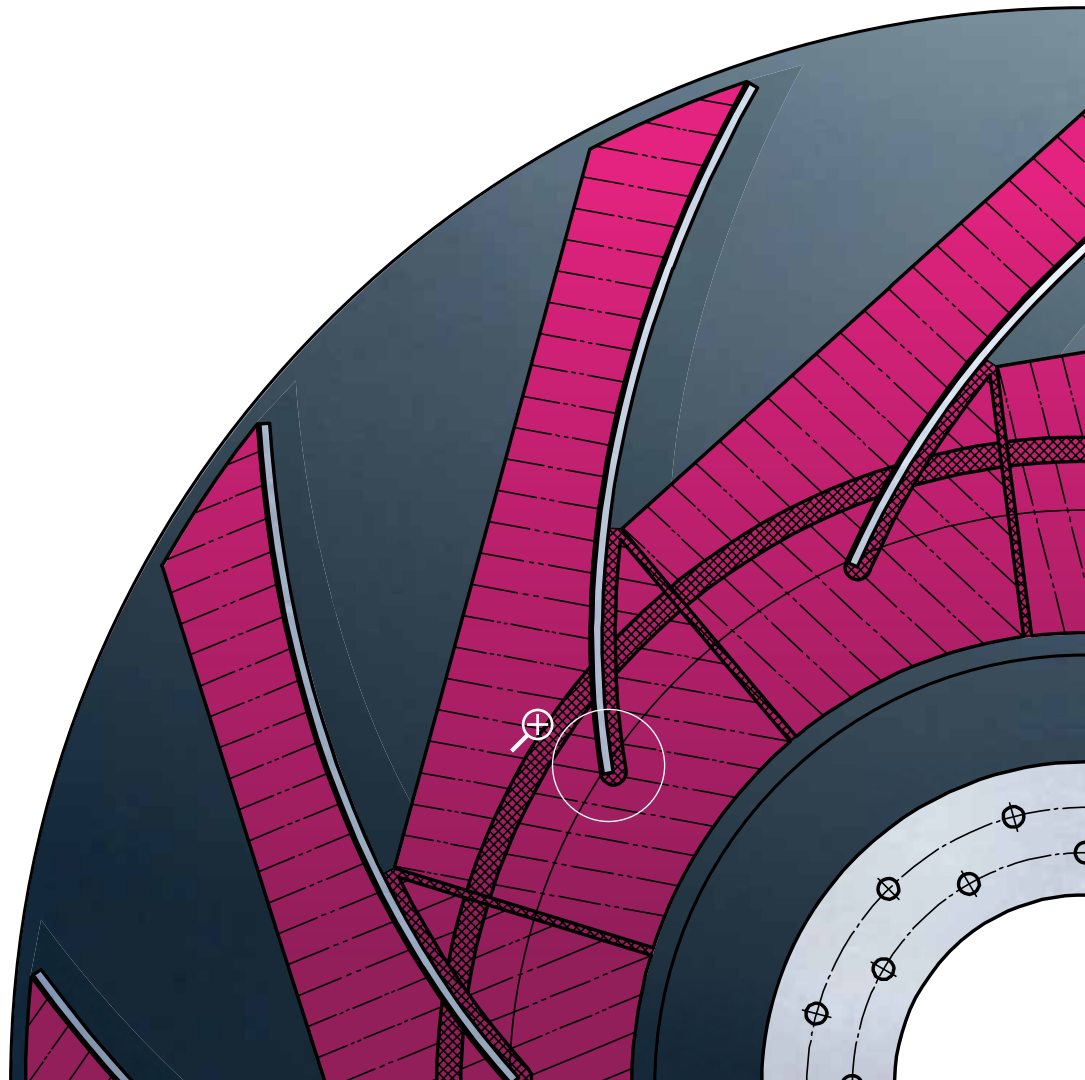
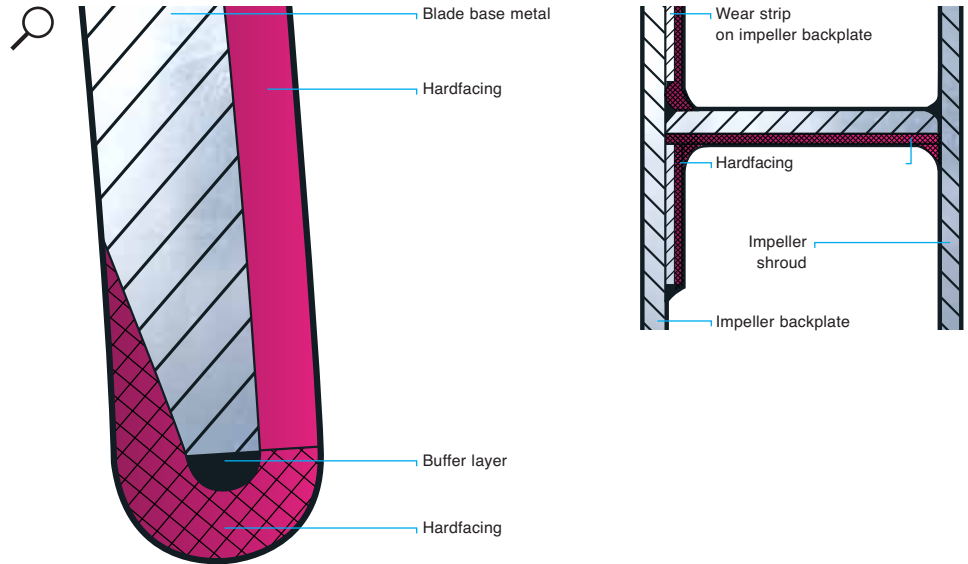
Wear protection pays

Large and special fans are often exposed to the harshest wear attacks. Abrasive media that are carried in the air flow (e. g. clinker dust, quartz and also corundum, wood and plastic shavings) assault the material.

Wear can render high-quality machine parts inoperative in the shortest time. The resulting costs are considerable. To invest in preventive measures is economical.

Venti Oelde uses various measures to prevent abrasion to impellers and inner casing walls through friction and impact wear. Such protective measures are decided on as early as during the design of our fans. Suitable materials, high-precision machining and optimal blade geometry effectively increase service life.

Venti Oelde has verified the specific properties of the various materials and combinations through many series of tests. Precise knowledge of the process conditions allows us to select the most suitable measures for each application and load intensity. Examples of materials used are surface-hardened steels and steel alloys containing manganese and also composite materials that are sintered at high temperature.



The optimized geometry of our impellers guards against caking. The shape of our inlet-boxes, impellers and volute casings are so designed that wear and caking is minimized.

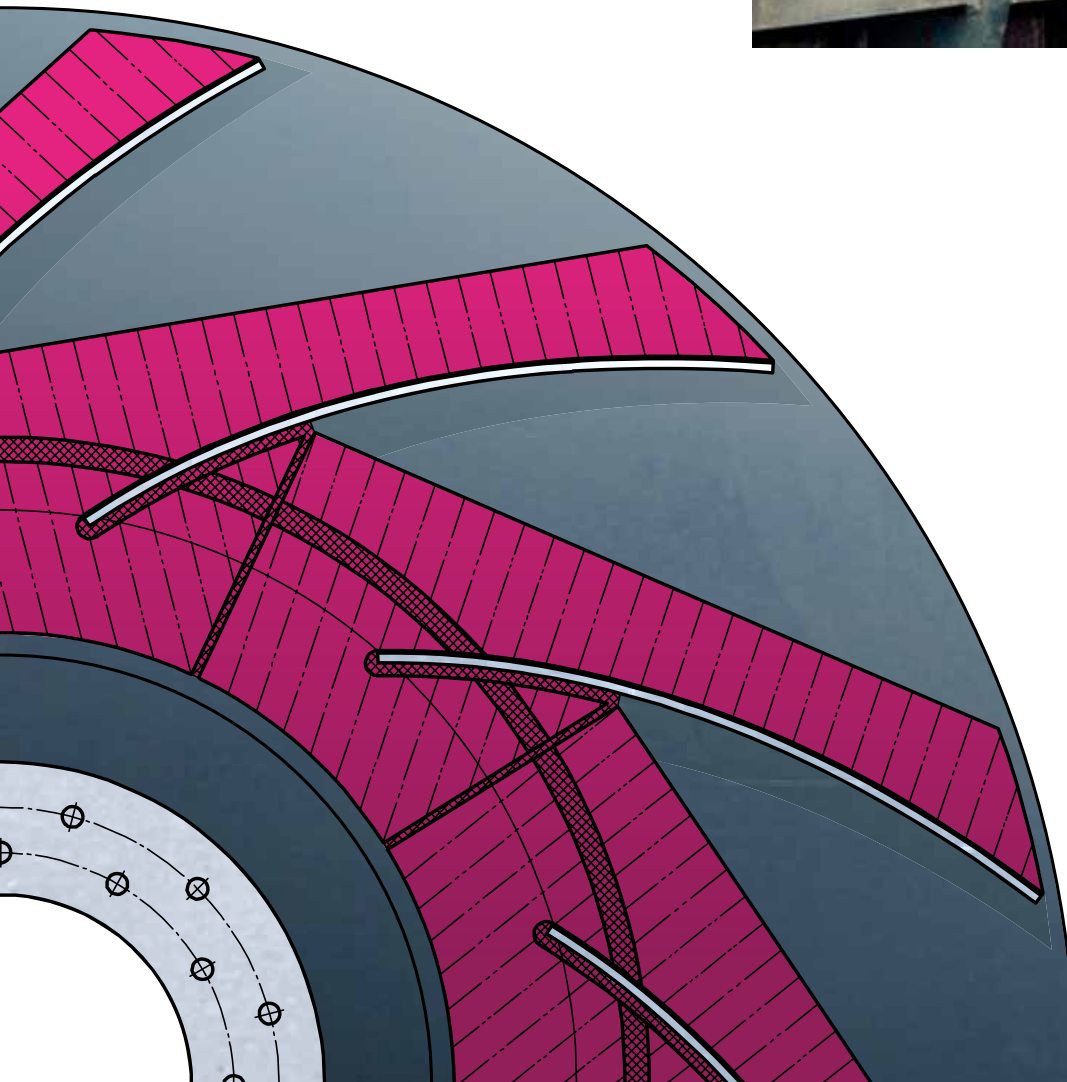
Hardfacing is ideal for fending off extensive wear attacks. Replaceable wear spirals, wear plates and deflecting plates are versatile in their application. With particularly abrasive media, surfaces are protected by hardfacing using tungsten or chromium carbide, whereby the service life of the components is many times increased. Lining by armouring is one of our quality features.



We can naturally hardface or reface impellers when repairs are carried out.

Venti Oelde utilizes water and compressed air injection and acoustic systems to detach sticky, adhering media. In special cases, the targeted addition of coarse, abrasive substances can allow a self-cleaning effect to be obtained.

Finally, our electronic monitoring systems reliably work for preventive maintenance and service at proven profitability. Installed vibration monitors control the oscillation amplitude and give early warning of dreaded material caking in the fan. Our dynamic balancing systems reduce any imbalance and vibrations by mass compensation.



Efficient noise control is functional

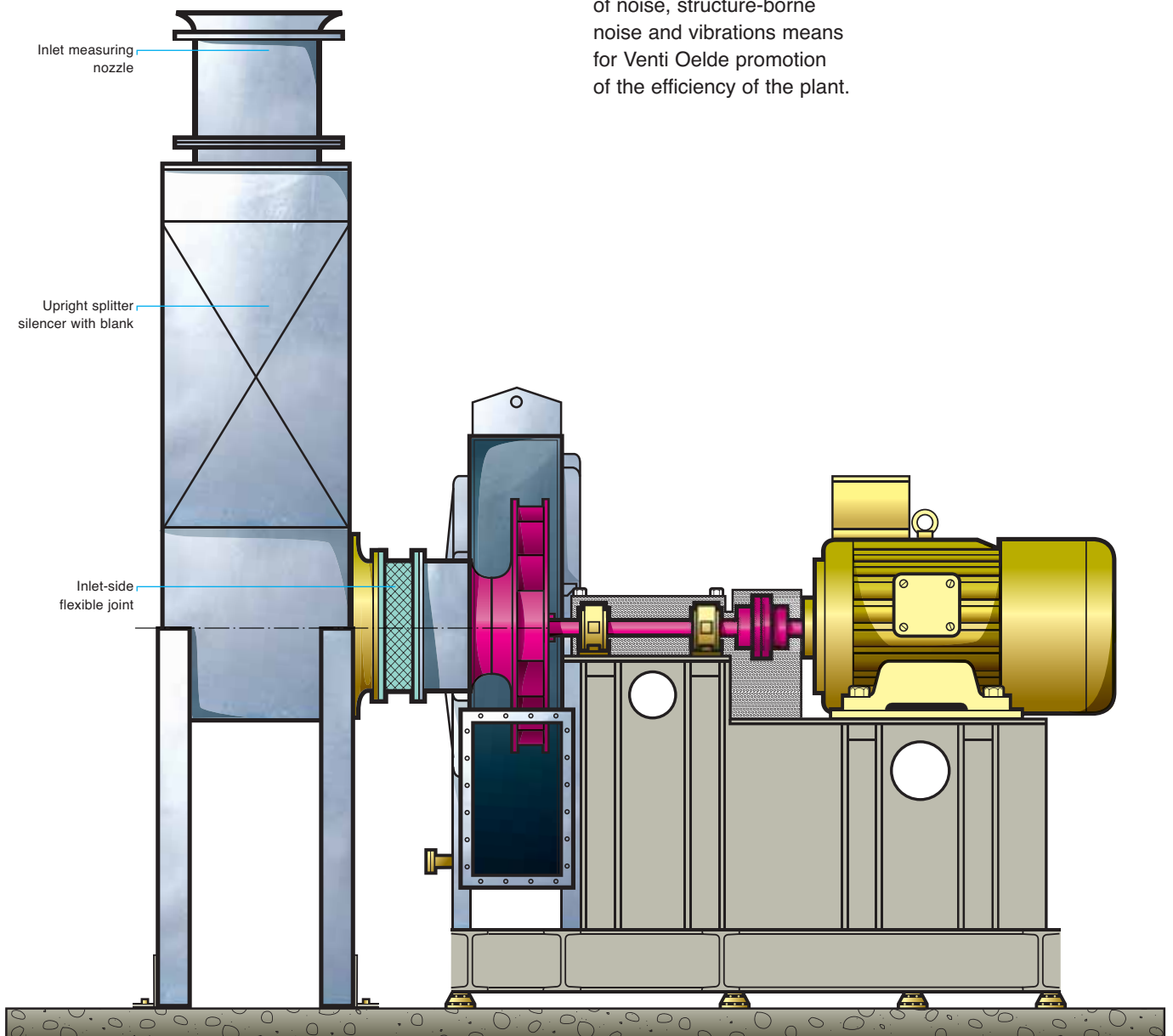


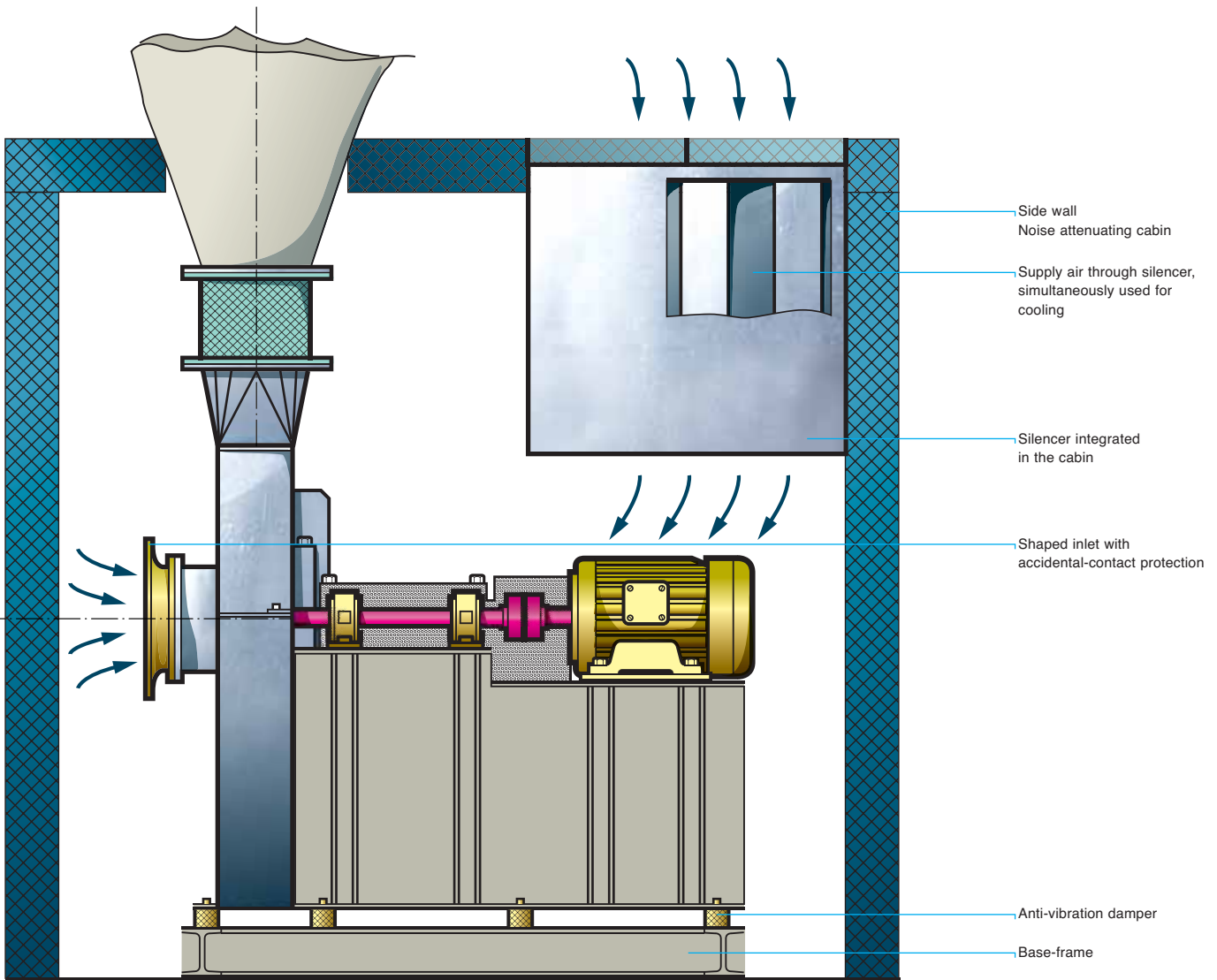
An important factor in the assessment of large and special fans in industrial plants is noise control. Efficient noise control predominantly serves the health of employees and provides noise relief in the workplace.

Sound-proofing requirements for workplaces and work locations are now legally regulated everywhere, although in varying forms. However, apart from the legal aspect, optimal sound-proofing is of considerable importance.

We have examined the causes of negative-effect vibrations and interference frequency levels in large and special fans by means of model experiments, measurements and computations. On this basis, we can carry out targeted countermeasures.

All relevant noise protection measures taken by Venti Oelde simultaneously serve the practicality of the plant and components. The targeted reduction and elimination of noise, structure-borne noise and vibrations means for Venti Oelde promotion of the efficiency of the plant.





Venti Oelde offers made-to-measure noise protection. We adapt our products to the on-site conditions, operational requirements and the valid regulations. In this way, our plants even comply with international regulations.



Noise protection is often a fixed element of the delivery scope of our large and special fans. All major components of our fans are noise optimized

by our own technical development. In addition, individual noise control measures simultaneously serve as insulation against heat loss. In doing so, Venti Oelde offers particularly budget-friendly solutions.

In addition, we can carry out further measures, like the insulation and decoupling of structure-borne noise from the floor foundation and to connections. Carriers of emissions to the outside, like fresh

air intake ducting and stacks can be insulated, for example, by means of silencers. We can naturally completely encase fans and drive units.

In rare cases a combination of enclosure and insulation is appropriate. For the optimum use of frequency-controlled drives special noise-reducing measures are necessary. Venti Oelde provides noise control for every application – individual and efficient.

Service right from the start

The services that Venti Oelde provides start with the first contact and extend right through to support during regular operation – because competent advice requires a holistic approach.

From projecting to the planning phase and from engineering to the installation, you have a personal contact for advice and assistance the whole time. In this way, we bring the desired solution to fruition in the shortest time.

We see conscientious planning as the basis for efficient operation. Venti Oelde configures fans according to the

individual requirements of the customer and on the basis of our own appraisal and measurements. We also fathom out optimization potential for existing plants individually.

Our customers benefit directly from our competence in the construction of large fans, as the experience from comparable applications is utilized in each new development and optimization. We use our know-how in aerodynamics, acoustics and vibration engineering to continually further develop and optimize our fans and systems. In this way, Venti Oelde can provide solutions to even the most de-



manding tasks in the various fields of application.

Our comprehensive range of services promotes cooperation, and builds up the trust required for long-term and successful partnerships.





Venti Oelde specialists are there personally for all relevant work – for installation and commissioning as well as maintenance and servicing. They instruct your employees on-site and, as a special service, also carry out training of your qualified personnel. All backed-up by

our Service-Hotline, available around the clock.



The rapid availability of technical support also applies to our spare parts service.

Should an interruption in production be necessary to expand existing plants or to carry out repairs, we will do the necessary work at night and weekends. In this way, downtime is reduced to a minimum.

In addition to our conventional maintenance service, we also offer telemonitoring of the plant with electronic data transmission. The telediagnosis provides us early with concrete indications of irregularities and allows us, when required, to carry out a rapid and precise fault analysis. With this form of preventive maintenance we can as a rule avoid costly repairs in advance. Should the customer so desire, we offer a specific and controlled online monitoring.



- Industrial fans
- Dust collection and process air cleaning plants
- Exhaust air treatment plants
- Ventilating, heating and air conditioning plants
- Recycling and waste processing plants
- Surface technology



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