NOISE PROTECTION OF INDUSTRIAL PLANTS

Acoustic systems for noise reduction.

SILENCERS | NOISE PROTECTION

Furtak & Salvenmoser
INDUSTRIAL SILENCERS

DESIGNED FOR SATISFACTION – YOUR ENGINEERING COMPANY FOR ACOUSTIC SOLUTIONS

As we put the requirements of our customers in first place, we aim to offer cost efficient and sustainable solutions. **Reliability, quality, flexibility** and **sustainable relations with all our business partners** are the pillars of our company. Our engineering office operates regionally and globally, supported by a worldwide supplier network.

We bring **20 years of international experience in industrial goods,** large scale know-how and a complete value chain to our customers benefit. **That is for you: high quality, reduced development period, fewer consultations and subsequently lower costs.**

Our mission is to be a professional supplier and a reliable business partner in a market of continuously growing requirements. **Our highest priority is excellent quality from the first consulting until the project finalisation.** Therefore, our company Furtak & Salvenmoser GmbH is **ISO 9001:2015** certified.

Our company philosophy.

RELIABLE, FLEXIBLE, HIGH QUALITY = SUSTAINABILITY

Customized according the requirements.

Reliability is of particular importance for large-scale projects. Starting with your first inquiry we set value on solution-oriented relations in partnership. Our expert and proper design of the noise protection equipment tells its own tale. This grants to you transparency and avoids unpleasant surprises throughout the complete project.

OUR SERVICES ARE CUSTOMIZED FOR EVERY CUSTOMER AND INCLUDE THE FOLLOWING KEY ASPECTS:

- Design and conception
- 3D Layout Design and detailed design
- Project management and calculations
- Provision and manufacturing
- Inspection and acceptance test
- Transport, packing and customs
- Site management

BETTER ACOUSTICS ARE PROJECTABLE

ONE-STOP SOLUTIONS

HIGH QUALITY WARRANTS FOR LONG LASTING SATISFACTION.

- Exclusive use of high-grade and certified materials
- Fixed price guarantee
- Statically proved, durable design
- Individually adaptable accessories
- Turnkey solutions
- Quality management system, certified according to ISO 9001:2015
- Standards and design codes freely selectable

OUR SCOPE OF SUPPLY AT A GLANCE:

- Blow-off silencer after safety and control valves
- Exhaust gas silencer / Flue gas Silencer
- Absorption silencer / splitter silencer
- Inline Silencer and suction silencer
- Fixed and movable sound walls
- Acoustic enclosures
- Acoustic claddings / sound insulation
- Exhaust systems & test benches for machines and engines (hush houses)

Professional noise protection
for industrial plants.

SYSTEMATICALLY PLANNED NOISE PROTECTION.

Wherever machines run there is noise emission. Exposure to high levels of noise can do damage to men and environment. We are experts in **layout, planning, production and assembly of industrial noise protection components.** For a pleasantly silent environment – for now and for the future.

ELABORATE AND CERTIFIED – FOR ANY CASE

Beside facilities for electric power, petro-chemical or air separation facilities – the efficient products of Furtak & Salvenmoser are the solution of choice.

All components are constructed according to the current regulations rules and standards of engineering.

Our network of contractors includes exclu-sively certified specialist companies, which we monitor and audit on a regularly basis.

ACOUSTIC SOLUTIONS FOR EVERY INDUSTRIAL SECTOR

BLOW-OFF SILENCER

Our Blow-off Silencers are primarily used for **a reduction of noise emissions at valve-based systems.** Furthermore, the silencers can be used for start-up processes. We also quote temporary solutions to our customers for the first blow-out of the tubes.

FROM 170 TO 100 IN THE BLINK OF AN EYE? NO PROBLEM.

Blow-off silencers are so-called **combinatory silencers,** which work by means of counter-acting principles (throttle and absorption). While the throttle reduces the pulsation of flow by means of balancing procedures, absorption helps to **convert sound energy into heat energy** by means of dissipation. Due to the correct design of the individual components, very high sound power levels of up to 170 dB(A) can be reduced for more than 70 dB.

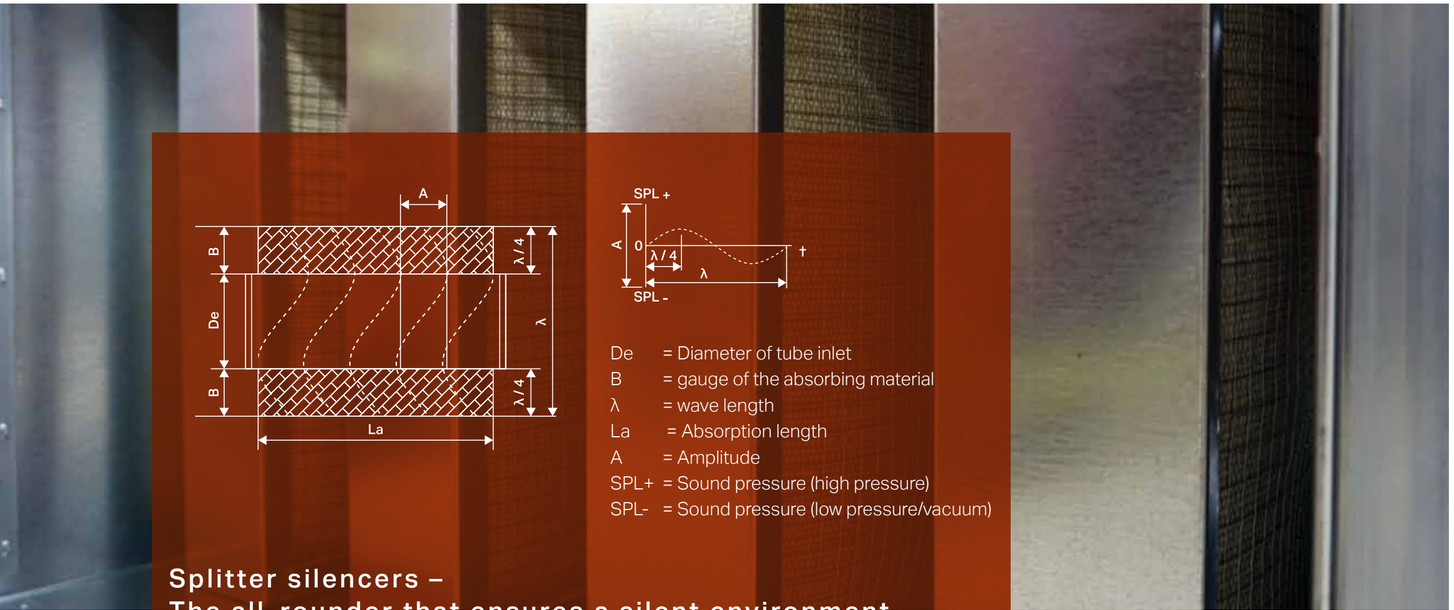
THE MOST IMPORTANT APPLICATIONS:

- Valve and blow-off systems
- Start-up activities
- Bypass for turbines
- Blow-off of various gases

EQUIPMENT TYPES:

- Air separation plants
- Gas plants
- Power plants
- Chemical plants
- Petrochemical plants

Combination silencer systems - turns sound into energy.



De = Diameter of tube inlet
B = gauge of the absorbing material
λ = wave length
La = Absorption length
A = Amplitude
SPL+ = Sound pressure (high pressure)
SPL- = Sound pressure (low pressure/vacuum)

Splitter silencers –
The all-rounder that ensures a silent environment.

ABSORPTION AND SPLITTER SILENCER

Absorption and splitter silencer are identified as per their internals. We fill these internals with **highly efficient acoustic material.** These materials are of convincing quality in their highly professional **sound absorption as well as in their resistance against fire and humidity** (hydrophobic). This also allows to operate our sound absorbers in very inconvenient environmental conditions on a permanent and efficient basis.
The structure of the absorber modules is conceived as per the application on an individual basis. In the case of high velocities of flow transparent acoustic covers will be used next to perforated metal sheets.

THE MOST IMPORTANT APPLICATIONS:

- Ventilators (suction and exhaust side)
- Suction ducts
- Exhaust pipes

EQUIPMENT TYPES:

- Power plants (bypass and HRSG)
- Paper manufacturing plants
- Gas and chemical plants
- Steel production plants
- Air condition plant

EXHAUST GAS SILENCER

ATTENUATION OF UP TO 55 DB.

Our silencers allow to define precise settings of low to medium frequencies and **combine several acoustic principles** all-in-one.
The airborne noise of deep frequencies is counter-acted by so-called plate resonators and λ/4 resonators which, in combination with an absorption, achieve broadband attenuation of up to 55 dB.

THIS SYSTEM CAN ALSO BE USED FOR GAS.

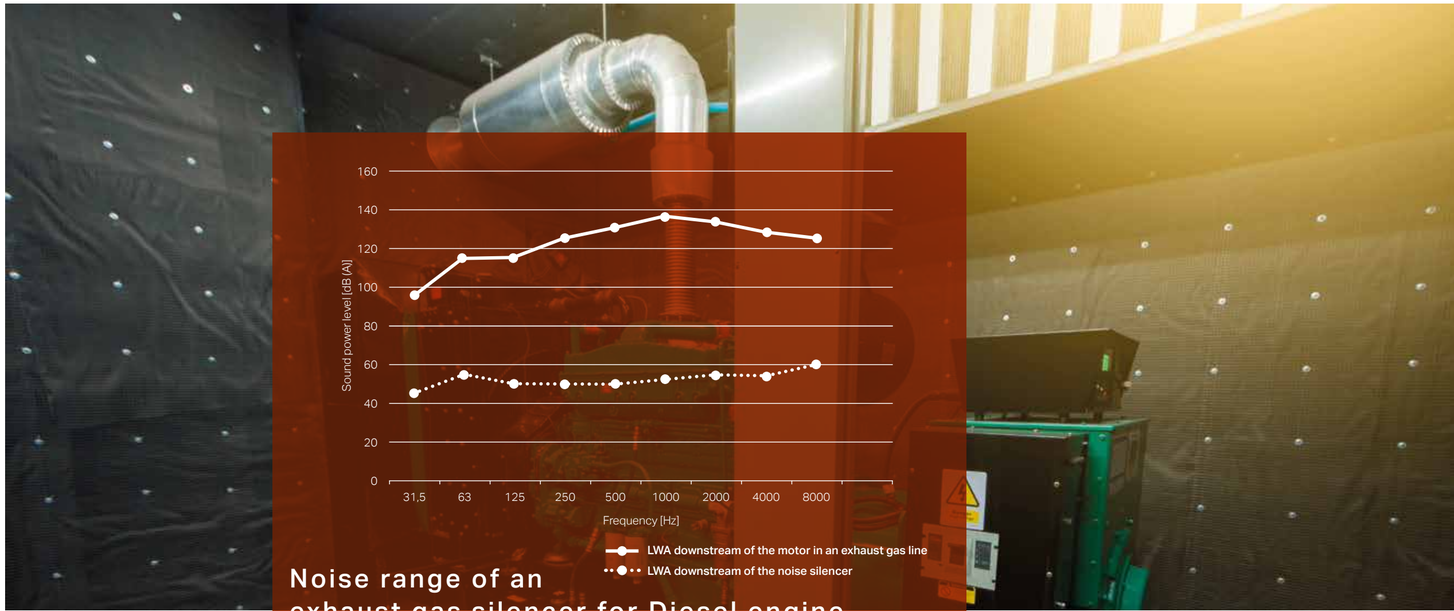
Moreover, as the chamber is not able to absorb the dirt completely the attenuation by means of **resonator chambers is appropriate in case of gaseous media with high particle production.**
Exhaust gas temperatures of up to 500°C can be countered by using suitable material permanently problem-free.

APPLICATIONS:

- Exhaust pipes
- Turbo machines

EQUIPMENT TYPES:

- Engine
- Diesel generator
- Natural gas
- Compressor



Noise range of an exhaust gas silencer for Diesel engine

Inline silencer -
Customized for the environment.

In every transport of elastic media mechanic vibrations are generated as well as noise emission. The sound is transmitted via the structure (e.g. a pipe) outwards into the air and can cause very high noise loads at the immission points. As these are in most cases closed systems within a pressure circuit, **the noise absorber must be integrated into this environment.** High temperatures and the use of different gaseous media is taken into consideration for the noise absorbers.

DRIVEN BY GUIDELINES AND RULES.

All our pressure silencer designs are **developed in concert with the valid standards**, as e.g. the pressure equipment directive. Our scope of supply includes the manufacturing and coordination with the indicated position so that with the completion of the products conformal CE-marking is possible.

APPLICATIONS:

- Tubes
- Pressure circuits
- Steam reforming stations

INLINE AND PRESSURE SILENCER

STATIONARY AND MOVABLE SOUND WALLS

SEPARATING WALLS - ADJUSTABLE AS NOWADAYS WORKING WORLD.

The stationary and movable sound walls of Furtak & Salvenmoser GmbH are in the most parts applied in the reduction of noise emission in the workshop.

The separating walls can be used in versatile ways, as they are made from high-grade and robust material - for silent and efficient workplaces. The product can be installed either stationary with fixings or mounted on wheels, to be mobile.

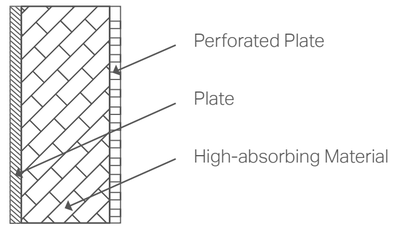
The sizes are freely scalable. Every wall can be adjusted in any demanded position. Furthermore, our separating walls can be armed with arc shields, so close grinding work is possible without danger of fire, smoke and injuries.

Outstanding measuring results at an acoustic test bench for walls – confirmed by an independent acoustic office:

Certified sound-insulating capacity and sound absorption degree.

THE ADVANTAGES OF THE MOBILE AND STATIONARY PARTITION WALLS:

- simple to assemble and individually extendable
- free selection of angles
- Height differences can be balanced
- high sound reduction index (Rw ≥ 34 dB)
- significant sound absorption (α ≥ 0,90)
- No maintenance required
- Statically checked and high-quality materials
- Incombustible with high fire resistance rating (optional also with arc shield)



STATIONARY AND MOVABLE SOUND WALLS

ACOUSTIC ENCLOSURES

Acoustic Enclosures are to be used in every situation, when the emitted **noise energy is transmitted via different solid bodies into the air** and this way **noise exposure outside the limits** are culminated. Most of our noise protection systems for reduction of the reverberation time and the increase of the sound reduction index capacity is applied at industrial plants (power plants, petrochemical plants, gas plants, ...).

NOISE REDUCED.
SILENCE CREATED.

By **encapsulation of the noise source** and due to porous and open-pore material that encloses and absorbs the sound it is possible to convert the sound energy into heat energy. We offer solutions to encapsulate single noise sources as well as bigger technical facilities.

We provide one-step service beginning with consultancy to design on to handling, manufacturing to the final assembly.
Not only the noise absorbing walls but the steel structure design, too, is calculated and **planned on a low-cost basis by our experts.**

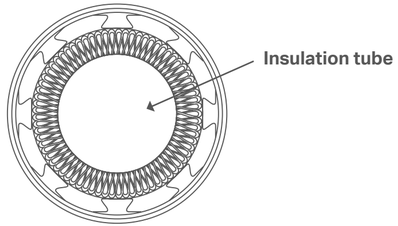
Noise protection systems –
Simply encapsulate the noise source.

External insulation –
the sound level is systematically reduced.

REDUCE SOUND IMISSIONS NEXT TO EFFORTLESS.

To reduce the amount of the emitted sound pressure level to the atmosphere of, e.g. tubing, the tube is coated with sound-absorbing insulation. This way you can systematically reduce sound emission.

Another variant of the acoustically efficient sound claddings can be used on the so-called absorption linings for walls and ceilings. For this purpose, we reduce the **reflection of sound waves at hard surfaces using a variety of materials**, that enable us to reduce the reverberant time.



Principle sketch of an acoustic tube

SOUND INSULATION

ATTENUATION
The attained attenuation is the reduction of an input signal by means of the resistance towards an output signal.

EVALUATION FILTER
When a sound level is indicated with an evaluation filter, the type that was used is specified by the unit it can measure e.g. of dB into dB(A). The value in brackets shows that the corresponding filter was applied to the spectrum. In case that no filter was used, the unit dB(lin) is used.

GAS NOISE
The propagation of noise waves in a gas is due to longitudinal waves - also called dilatation waves. The motion of particles is called propagation direction. The creation of the gas noise is based on the fact, that due to the stimulation of the air an over- and under-pressure is created that will lead to particle movement.

IMPEDANCE
Impedance (Z) is also called an acoustic field impedance and describes the resistance in a levelled field of waves. It is calculated by the relation of pressure (p) to the velocity of sounds (v). Also, the field impedance can be computed by the sound velocity (c), under consideration of the temperature (T) and the density (ρ).

OUR SMALL INDUSTRY-ACOUSTIC REFERENCE BOOK

NOISE
We call noise mechanical oscillations in the human hearing range of 16 Hz to 16,000 Hz.

NOISE LEVEL
Used in every-day language and refers to the designations of sound capacity and sound capacity levels, which are normally indicated in Decibels.

REVERBERATION TIME
The reverberation time describes the precise time it takes a noise pressure level to lose 60 dB of the input signal in the room.

SOUND INTENSITY
The sound intensity level (LI) is the logarithmic ratio of the sound intensity (I) in a sound field with a reference value of IO.

SOUND POWER LEVEL
The Sound power level (LW) describes the strength of a sound source.

SOUND PRESSURE LEVEL
The sound pressure level (LP) describes the sound impact (sound immission) at a certain place. It strongly depends on the type of the environment (indoor, outdoor, distance from the sound source).

SOUND REDUCTION INDEX
The sound reduction index (R) is an acoustic quantity which describes the difference between sound emission and sound absorption of a component of one or several shells.

SPECTRUM
A spectrum is the representation of the signal strength as function of frequency and wavelength.

STRUCTURE-BORNE NOISE
Structure-borne noise is the propagation of waves in solid bodies. In difference to gas noise and the longitudinal waves the type of propagation can also be carried out in form of transversal, expansion and bending waves. The wave types can be classified according to the propagation direction and depending on the oscillation direction.

TRANSMISSION
Transmission of different sound types (e.g. the stimulation of gas sound compared to solid body sound).

Furtak & Salvenmoser

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