THE SILENCER HANDBOOK

FAULT PREVENTION

ENSURING LASTING & SAFE OPERATION OF YOUR SILENCER

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To ensure a satisfactory function of the silencer and optimal noise attenuation, attention should be paid to the following aspects, which - if neglected - could cause malfunction or reduced performance.

1. INSTALLATION ISSUES

1.1 VENT SILENCER INSTALLATION

Vent silencers should be installed at a possibly high location, away from work areas and facades, preferably on a roof.

Vent silencers should not be installed near a higher wall, façade or building. Nearby surfaces reflect noise, causing increased sound pressure levels.

Vent silencers must never be installed inside a building, or close to regularly used work areas

optimal installation of a vent silencer on a roof, ensuring maximum noise reduction and safe operation

dangerous, potentially lethal installation of a silencer inside a building

WARNING - DANGER

The gas flow from a vent silencer can be hazardous, e.g. asphyxiant, toxic and/or and extremely hot!

VENT SILENCERS MUST BE INSTALLED SO THAT NO PERSON CAN BE EXPOSED TO THE BLOW-OFF PLUME AT ANY TIME!

1.2 ACOUSTIC INSULATION

When designing an economically and acoustically efficient blow-off installation, it is vital to consider the entire system. Still, it unfortunately happens quite frequently that the high noise reduction achievable with a modern vent silencer is annulled by noise emitted from not or poorly insulated pipes or valves nearby.

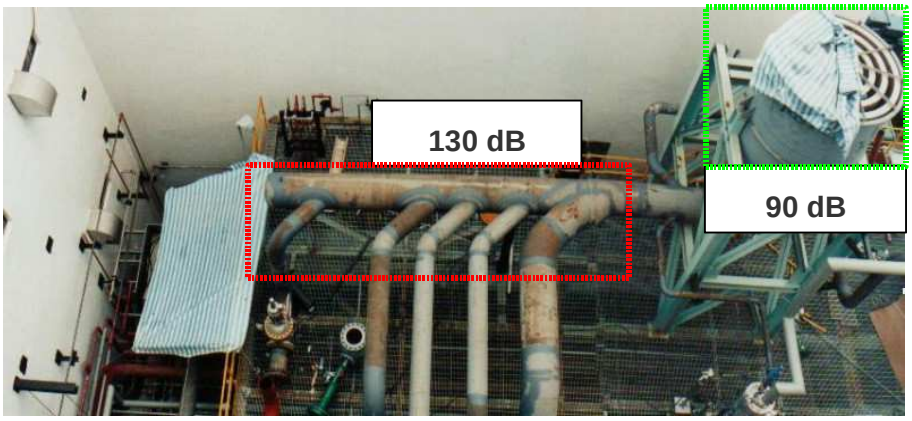
The best approach to noise reduction is noise prevention by suitable system design, in particular of the transfer pipes. As a general rule, flow pipe diameters should be large, constant and the pipes possibly straight. This will keep the flow rate low, reduce the pressure loss in the pipe and minimise turbulent flow conditions.

To be efficient, these measures have to be implemented comprehensively; it makes little sense to e.g. match the dimension of the blow-off pipe to a valve outlet and increase the diameter only just before the silencer, as shown in the example below. The high blow-off speed in the thinner duct section causes pressure losses in the blow-off pipe, leading to increased sound emissions from the pipe.

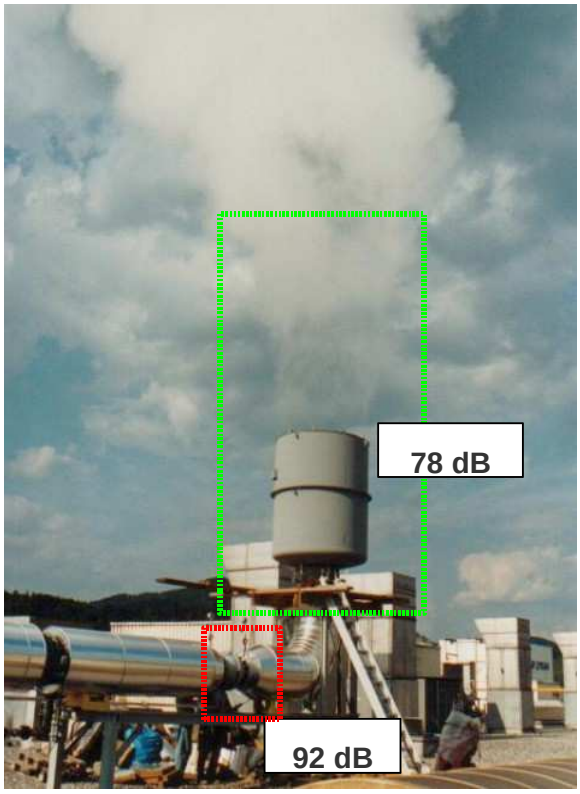
the blow-off pipe is not insulated and too small in diameter in the lower section, causing avoidable noise emissions

positive example of a properly installed and insulated blow-off pipe and silencer

In addition to noise avoidance, acoustic insulation is essential to minimise noise dissipation:



Example of a poorly designed blow-off installation: although the noise of the exhausted gas is efficiently attenuated by a silencer, the non-insulated, bent and branching blow-off pipes cause very high noise emissions.



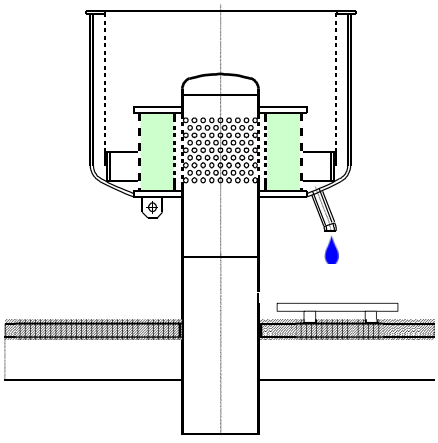
Blow-off installation with improvement potential: while the noise of the effluent gas is successfully muffled by the vent silencer and the blow-off pipe is suitably insulated, the valve is not and thus becomes the dominating source of noise.

1.3 DEWATERING OF VENT SILENCERS

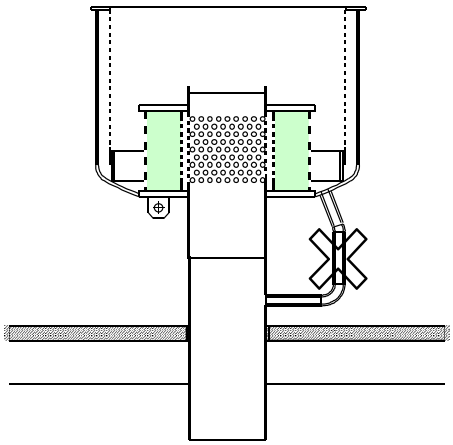
Preferably, the dewatering pipe should be connected to a pressure-free drainage system. In sub-zero temperature environments, it may become necessary to prevent freezing:

the (non-insulated) dewatering pipe is connected to the drainage by a possibly short pipe, which is kept close to the silencer body

a long, non-insulated drainage pipe is prone to freezing at sub-zero temperatures, thus preventing dewatering of the silencer



when using an open drain system, a plate or cup beneath the dewatering pipe helps preventing long-term roof damage by (hot) dripping condensate



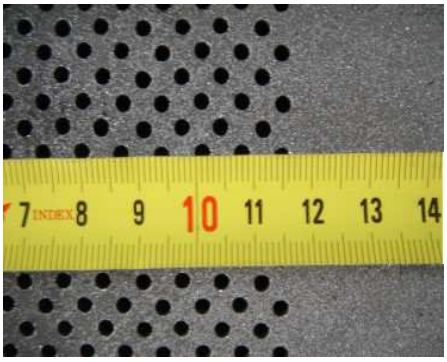
the drain must never by-pass the diffuser, as this would significantly reduce the noise reduction efficiency of the silencer and may damage the entire installation

2. SILENCER DESIGN ISSUES

2.1 DIFFUSER DESIGN

OUR DESIGN

… uses seamless diffuser pipes, wrapped with high quality stainless-steel wire mesh to reduce swirls



… uses customised designs with small borings, achieving a better noise reduction and shifting the peak frequency to values that can be more efficiently attenuated

… quality tests all compression-loaded welds, ensuring operational safety

OTHERS

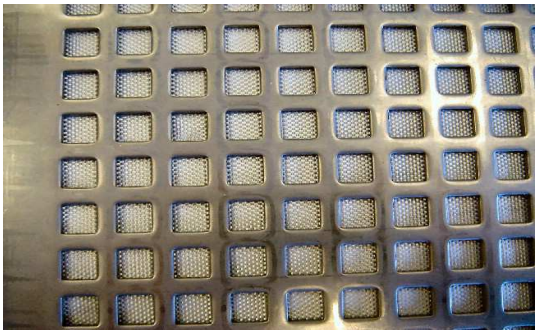
… use just perforated plates as diffuser; in addition to a larger size, the absence of wire mesh causes flow noise emissions

… use standard perforated die plates with significantly larger diameters, resulting in inferior noise reduction and hard-to-attenuate low-frequency emissions

… may not care that much …

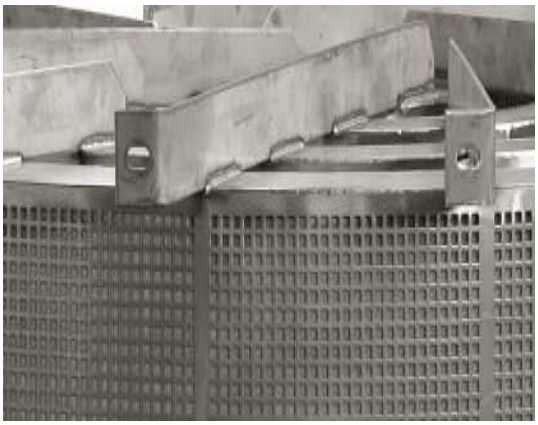
2.2 ABSORBER DESIGN

OUR DESIGN



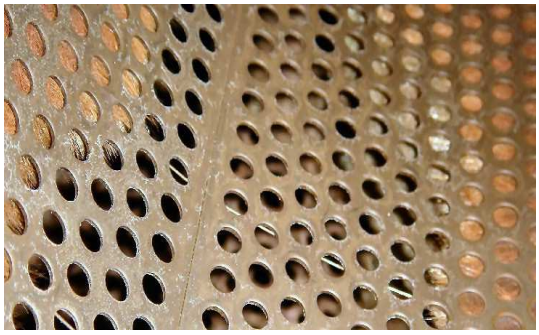
… uses strong, heat resistant glass fabric linings that cover the absorbing materials

… uses absorbers structures made entirely from stainless steel

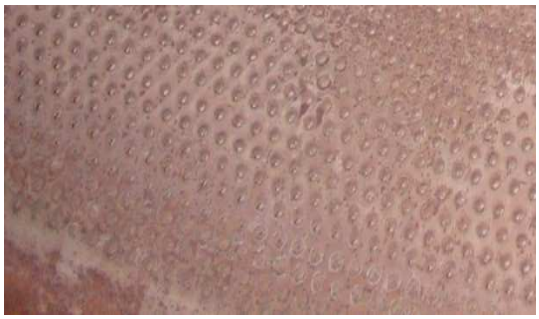


… uses continuous welding on all parts, warranting long service life

OTHERS



… use cheaper fleece materials that start getting blown out after a few blow-off events



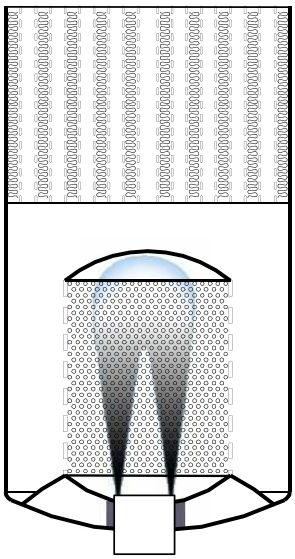
… use carbon steel elements that will corrode quickly under application conditions

… use standard spot welding, resulting in (noisy) vibrations and early fatigue

2.3 SILENCER FAILURES CAUSED BY POOR DESIGN

Over the years, we have successfully repaired or replaced many silencers produced by competing manufacturers.

The following example shows the consequences of using a less-than-optimal design in an industrial steam silencer. In the original layout, the steam jet hit the head of the diffuser with sonic speed and high temperature. This not only destroyed the diffuser, but also the absorber core suspensions, blowing the massive absorber stage out of the silencer shell:

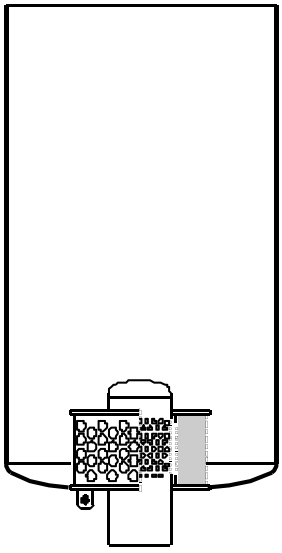


original silencer layout

destroyed diffuser

blown-out absorber stage

The diffuser cage and the absorber were removed and replaced with our own diffuser. Now, the steam vent silencer works efficiently and reliably without any trouble:



silencer repair with our diffuser

diffuser replacement

installation of the repaired silencer

A second example of a catastrophic failure caused by cost saving design is shown below. A poorly welded seam and corrosion led to material failure:

As a direct consequence, the entire massive absorber stage blew out of the silencer and hit the ground …