

## Sound and vibration in ships from exhaust gas pipes.

Exhaust gas pipes are mounted to transport the exhaust gas from engine to funnel and lead the gas out in the open. Hence, the exhaust gas pipes are exposed to vibration from pulsation of the gas from the engine but also break out noise from the exhaust gas.

As the exhaust gas pipes need fixing and support going from engine to funnel, vibration and noise is present along the whole pipeline. Unless action and precaution is taken the vibration will be transmitted into the structure of the ship both as noise and as vibration. In other words, the vibration will be structure borne sound.

The structure borne sound will be transmitted into the structure of the ship from the connection points of the exhaust gas pipes. The structure borne sound can be significantly reduced by correct mounting of fix points, guides and sliding which is specially designed for this use.

Fix points, guiding points and sliding points of the exhaust gas pipes should be provided in the earliest stage in ship design as possible to ensure enough structural stiffness. If the structural stiffness is insufficient, the vibrations will cause the structure to vibrate and nothing is gained.

Connection between exhaust gas pipes and structure can, as mentioned earlier, be divided into fix points and guiding- and sliding points.

Fix points are carrying the weight of the pipe just as they obtain the pressure load from the system and transfer the weight and load into the structure. Hence, the structure must be sufficiently rigid and strong to carry the load.

Fix points should be chosen where the movement of the pipeline from thermal expansion is minimal, typical near a change in direction of the pipeline.

Guiding points can also carry weight of horizontal pipelines, but cannot obtain pressure load from the system. Guiding points are used to ensure, that the pipeline is moving in a predictable and controlled manner and to minimise radial movement of the pipeline caused by vibration.

Guiding points and application must be chosen in order to allow the movement in the pipeline caused by thermal expansion.

Sliding points can carry weight of horizontal pipelines, but cannot obtain pressure load from the system. Sliding points ensure free axial movement of the pipeline caused by thermal expansion and ensure that the pipeline is moving in a controlled and predictable manner as well as it prevents radial movement in the pipeline coming from vibration.

Air borne sound is transmitted as a break out noise from the pipeline. This noise can be absorbed by thermal insulating material outside the pipe.

