

1.7.19. ACOUSTIC EMISSION SIGNAL ATTENUATION IN THE WAVEGUIDES USED IN UNDERWATER AE TESTING

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While carrying out the acoustic emission testing in common case the AE sensors should be mounted on the surface of tested structure. It gives high sensitivity and reliability of testing.

In some cases there is no possibility to place the sensors on the structure directly (high temperature, aggressive environment, etc.). The one of the most efficient way to transport the stress wave (AE) from the structure to sensor is the waveguide, which looks usually like the long thin rod or plate.

The specific case is the underwater AE testing with limited access to the structure.

This report shows some results on signal attenuation in waveguides having different length attached to the specimens placed in the water and air as well.

The waveguides were made of steel wire (12H18N10T) pieces 3 mm diameter and 10, 8, 6 and 5 m length. To decrease signal attenuation some waveguides were tempered at 1050°C. The end of waveguide was welded to steel plate at specific distance from the sensor, which played the role of pulser (S1). The other end of the waveguide was terminated by exponential concentrator and sensor (S2), which received the stress wave spreading from pulser through steel plate and waveguide. The sensor (S3) was mounted on the plate at the same distance from pulser as the welded waveguide tip. The pulser was triggered by rectangular pulse generator. The attenuation of stress wave amplitude was estimated by comparison of AE signals on S2 and S3. The test layout is shown in fig. 1.

All waveguides were tested both in water and empty bath. The results are shown in fig. 2.

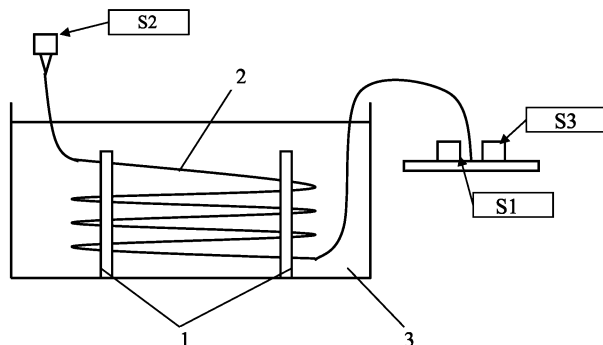


Fig. 1. The test layout:

1 – acoustic isolator rods, 2 – the waveguide, 3 – the bath with water

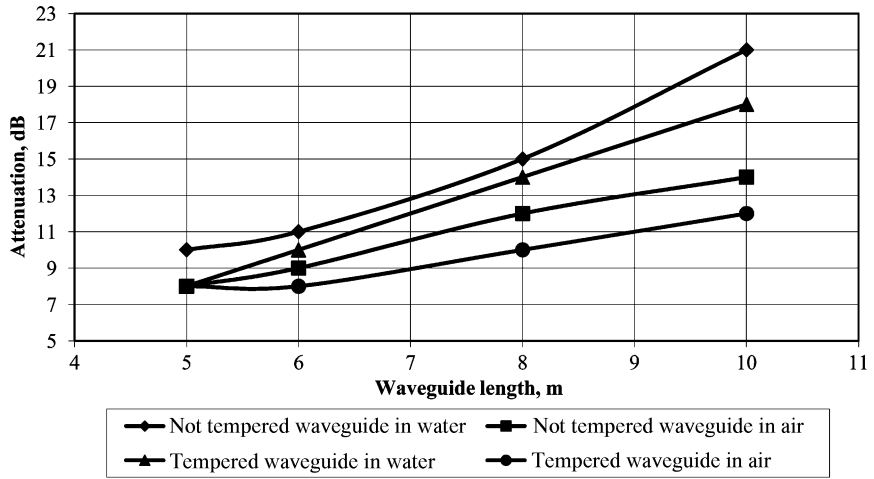


Fig. 2. The attenuation in Tempered and Not Tempered waveguides in water and air as function of their length

They are as followed:

1. The attenuation of amplitude is more significant when waveguide is in water.
2. The attenuation is less on tempered waveguides, that is important for long waveguides.
3. 6 to 12 dB attenuation on the 5–6 m long waveguides is good result that makes possible to use them in specific applications.
4. To avoid through water noise influence it is recommended to use waveguide shielding tubes.