

1.13.4. CRACK APPEARANCE ASSESSMENT BY EMITTED SOUND DURING STEEL QUENCHING

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The production of machine parts finished very often with quenching and tempering the manufacturing process. The most exacting machine parts often needs finalization like grinding, polishing etc. as a final stage of production. The mechanical properties, such as residual stresses and hardness layer, at last depend on optimum parameters of a quenching process chosen, and on controlling and monitoring of the entire process. In spite of that it happens that some parts failed also due to cracking of the material during quenching. When such part goes throw the final process and even is installed it may cause unnecessary high costs due to final machining or in the worst cases machine part breakdown. Detecting such faults in the due time therefore may reduce unnecessary costs.

During quenching the heat transfer from a specimen's surface to a quenching medium causes intensive film boiling and nucleate boiling round a heated specimen, which produces strong sound emission which differ from the sound signals caused due to specimen cracking by frequency and intensity. Specimen cracking due to high internal stresses causes sound signal which differ from regular sound emission as well. Too high internal stresses encountered could be caused by local deviations due to irregular heat removal, ie. vapour – film formation and do to too severe quenching agent chosen.

An investigation of sound emission in the quenching process was carried out with experimental setup for detection and evaluation of sound emission on cylindrical specimens made of heat-treatable steel quenched more severe quenching agents. Analysis and selection certain sound signals which differ from the regular sound emission can provide useful information regarding cracking and confirm the differences occurring in quenching with different quenching conditions.