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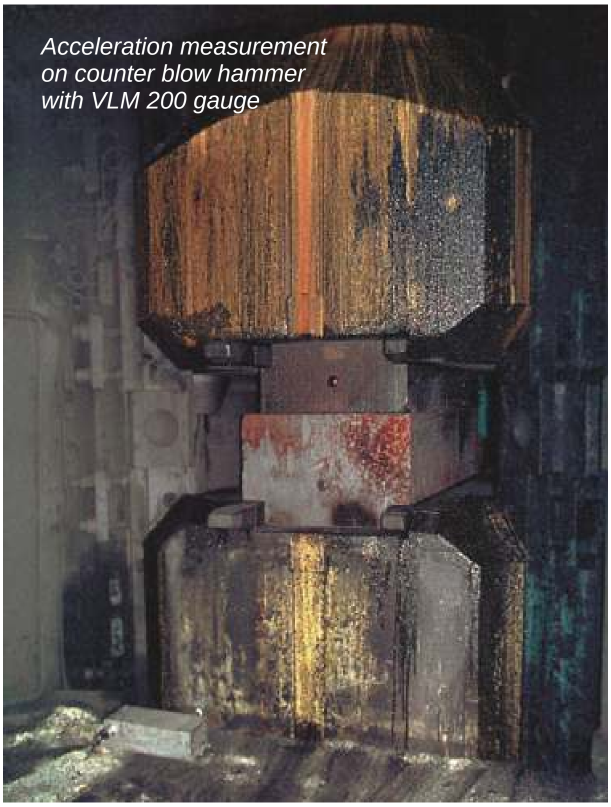
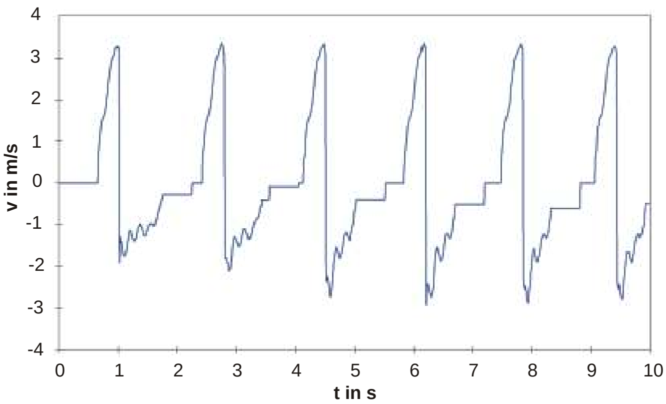
High Dynamic Speed Measurement on Hammer Dies

Forging Hammers are subjected to heavy dynamic stress. Impact speeds up to 8 m/s and accelerations greater than 20000 m/s² can lead to cracks in the dies and breakages.
To investigate such stresses was part of the purpose of our research project. For the high dynamic speed measurement, we used the VLM 200 measuring system, which works without physical contact. The accurate measurement of speed, with correct prefix, made a more accurate understanding of the forming process possible.



Acceleration measurement on counter blow hammer with VLM 200 gauge



A high proportion of forging produced in small and medium sized forges go to the motor industry. For example, out of approximately 50 million conrods produced per annum, two thirds are forged on hammers. In the research project, FEM simulation was used for the dynamic loading on the die. The basis was the calculation for the kinetic energy. For this calculation, it was necessary to know the speed of the hammer tup at the instant of impact. As are result of the extremely high acceleration, large mechanical stress was involved and for this reason only a speed measurement technique that did not involve physical contact was appropriate. Two speed measuring instruments, type VLM 200 SD were used. For the exact synchronised measurement on the two tups, the two measuring instruments were triggered externally. This made it possible to establish the speed sequences of the upper and lower tups simultaneously. One instrument was attached to a frame in front of the upper tup, the second instrument was positioned directly in front of the lower tup (see photograph). The measurements were recorded on the basis of speed against time. Electronic direction recognition was incorporated so that the values could be related to a direction. The diagram shows an example of speed variation measured during forming. The equipment for the measurement was matched to the conditions in the forge, namely the ambient tempera-ture, dirt, flying sparks, and vibrations, and the equipment was contained in a protective housing. A tube ensure unhindered optical access to the die surface (see photograph).
With the prefix to the measured speed, it was easy to interpret the measured values.It was clear that the rebound energy increased from blow to blow, and furthermore, it was noted that an oscillation of 5 Hz was superimposed on the return stroke movement. The information that the measurement provides is important for the control of the forming process and for quality assurance ■

VLM 200 inside protection case

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