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Angewandte Forschung für die Stahlindustrie

Department:
Systems and Process Development



„Intelligent Hook Mouth“

**Supervision of load suspension by means
of hook mouth sensor technology**

*A new patented system with
piezoelectric sensors*

*Developed in close collaboration with
VDEh-Betriebsforschungsinstitut (BFI)*



To handle ladles with liquid metal with the help of cranes, the laminated hooks for the load suspension must be positioned so that the trunnions of the ladle handler are within the opening (mouth) of the laminated hooks. This way is created the positive locking between the suspension element and the load that is required for safe lifting.

The suspension process is manually controlled by the crane operator, if required, supported by a banksman. The reliability, i.e. the correct execution of the suspension process involves the high risk that in case of lack of attention or poor visibility conditions it cannot be excluded that the ladle is caught one-sidedly by only one laminated hook or even on the tip of the hooks, which in the past already has led to tilting and falling of ladles.

A system with piezoelectric sensors enables the ladle trunnions to be detected within the mouth of laminated hooks even in extreme ambient conditions featured by deposits of foreign masses such as iron splashes, slag pieces and similar substances in the gap between the mouth shell and the ladle trunnion.

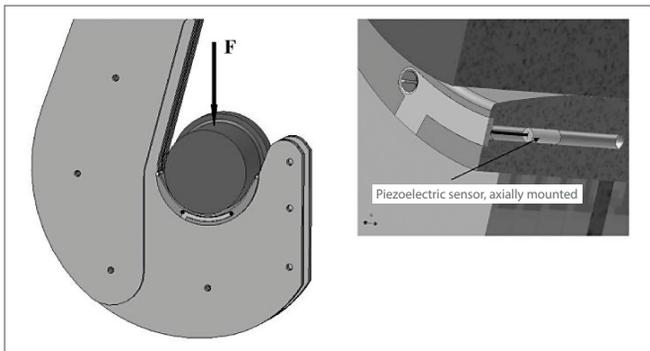


Fig.1: Sensor in bore hole from the front

The sensors can be incorporated into the laminated hooks similar to DIN 15407. The laminated hook is provided with an additional split blind lamina that is worked out at the hook back and forms a channel to guide the cable.

Because of the blind lamina and special mouth shell required it is not possible to subsequently install the system in existing laminated hooks.

Laminated hooks including the mouth shell can be received from Kranbau Koethen GmbH

The sensors are inserted into holes placed in the mouth shell from the front (fig. 1) near the contact area between the ladle trunnion and the mouth shell. This way there are no openings, holes or similar existing in the area of the bearing surface of the mouth shells and any restriction of the sensors by the ambient conditions is excluded.

The signal transmission takes place via cables led through the channel in the laminated hook to the lifting beam and from there via suspension cable to the crane trolley and through the trailing cable equipment to the crane control system.

Essentially, the electronic signal processing system consists of the charge amplifier and microcontroller components as well as the supply unit. The charge amplifier is installed on the crane lifting beam, and the microcontroller and the supply unit are placed in the control room of the crane girder. In addition to the signals coming from the charge amplifier, the micro-controller needs to be provided with the signals „Lifting“ and „Weight“ as input signals.

The output signals, for ex. for visual and/or acoustic indications in the operator's cabin are provided at the microcontroller.