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Advances in Steels for Stronger Body-in-White and Enhanced Safety

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ABSTRACT
Over the past quarter century, the crashworthiness of production automobiles has improved significantly. sa Much of this improvement is the result of application of ultra-high strength steels in the safety cage or Body in White. Since the majority of steel mass resides in the BIW, mass reduction programs have largely focused on the BIW in programs to reduce the mass of automobiles. The development of, for example, 22MNB5, a high strength martensitic steel capable of being produced in very thin gauges, has been instrumental in this development of successful mass reduction programs.
Not surprisingly, the static tensile properties of the steel have been shown to be related firstly to the processing sequence it has experienced prior to annealing, and, secondly, to the annealing conditions employed. These combined phenomena have been carefully studied at Pitt as a prelude to conventional continuous annealing on Continuous Galvanizing Line Simulations. Although this original work was performed to explain the sheared edge behavior of the steels in HER tests, the marked influence on bulk properties could not be overlooked.

The bulk of this paper will focus on the properties of 22MNB5-type steels after conventional hardening treatments including cold mill processing, but will also discuss certain limitations caused by using these steels. One prominent problem is Hydrogen Embrittlement which might be more prevalent than first thought with the cathodic electrochemical reactions occurring during priming and other coating processing. A second issue is the potential crack nucleating features by cold hole punching introduced in the thin, long rail-like geometries found in modern BIW. These and others will be discussed in this presentation and publication.

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