

Introduction

INTRODUCTORY REMARKS

The Symposium on Charpy Impact Test--Factors and Variables had its genesis at the second meeting of Subcommittee 4--Fracture of ISO Technical Committee 164--Mechanical Testing. Subcommittee 4 had the assignment of reviewing ISO Recommended Practice for Verification of Pendulum Impact Testing Machines for Testing Steel, ISO Designation R442, and of revising where necessary. Although ISO, as does ASTM, requires that documents be reviewed at intervals not exceeding five years, this document had not been reviewed since it was first published in 1965 under the jurisdiction of ISO Technical Committee 17--Steel. There were 15 representatives from seven member countries and a representative from the European Community Bureau of Reference (BCR) at that meeting. The members of ISO technical committees are the national standard writing bodies--not individuals; national-standards writing bodies are organizations such as BSI, AFNOR, SIS, etc. Because there is no national-standards writing body in the United States, Congress has designated the American National Standards Institute (ANSI), as the de-facto body and therefore, the member from the United States.

At the subcommittee meeting, agreement was reached that numerous changes needed to be made--some tolerances were too restrictive, some were not restrictive enough, but there were problems in agreeing to the "correct" values. Agreement was reached for some values because various delegates informally presented work that they had personally performed, or reported on work that had been done in their country. However, other values could not be agreed upon because of divergent requirements in various national standards and the supporting data for the various proposals was not currently available. It was suggested that an international symposium be held to discuss the factors and variables that effect the Charpy impact test so that researchers around the world would have a forum at which to present data that would answer some of the questions that had been raised. The USA representative, on behalf of ASTM Committee E28-Mechanical Testing, agreed to sponsor such a symposium as part of the E28 meetings in November 1989. This STP is the result of that symposium.

The original goal of having world-wide research presented on the factors and variables of the Charpy test was achieved. There were three sessions containing 16 papers presented by authors from five different countries. Because attendance exceeded expectations, it appears as if more than just those writing specifications are interested in the topic.

SPECIFIC REMARKS

Twelve of the papers presented are being published in this STP, and one will be published in the ASTM Journal of Testing and Evaluation (Reference 1). The twelve papers fall into three categories, (1) those discussing the pendulum-impact machine, (2) those discussing the specimen, and (3) those discussing the testing techniques; several papers discuss more than one category. In summary, the papers present information on:

- * the effect of many of the dimensional parameters of an impact machine, including metrological techniques to evaluate these parameters and a compliance technique for verifying machine acceptability;
- * the effect of the geometry of the striker, that is, the 2-mm radius striker specified by ISO and much of the rest of the world, and the 8-mm striker specified by the ASTM;
- * the effect of the method of fabricating the notch of a CVN test piece including fatigue precracking;
- * the effect of specimen sizes in Charpy impact testing;
- * the effect of strain rate including slow-bend tests.

Because the dimensional parameters of the machines are so very important to obtain "proper" impact values, the papers by Porro, et.al., by Schmieder, by Revise, by Lowe, and by Naniwa all discuss how the test machine can influence the results obtained. These papers discuss the effects ranging from the attachment of the machine to its foundation to the metrological methods used to determine angles and linear dimensions. Several of the papers discuss several potential sources for variation in test results due to machine variations. Attention is drawn to the paper by Porro, et.al. presenting the results of a study on the compliance of a machine as a means of assessing its physical condition. Naniwa presents the results of an in-depth study of the differences in the behavior and the deformation of the specimen when struck by an 8-mm striker (the "ASTM striker") and when struck by a 2-mm striker (the "ISO striker").

The specimen was investigated from two points of view: (1) the method of preparing the notch, and (2) the size of the specimen. The papers by Koester and by Fink studied the effects of grinding versus single-point machining; the papers by Fields, et.al., by Mikalac, et.al., and by Interrante, et.al. studied the effect of notch acuity and the method(s) of obtaining a sharp notch. Alexander, et.al. investigated specimen size.

The influence of the temperature conditioning media on test results was reported by Nanstad, et.al. Their paper, and Reference 1, indicate that the temperature of the specimen in the vicinity of the notch at the instant of impact is not necessarily the same as the temperature of the conditioning media.

As a result of the various studies presented, ASTM Committee E28 has initiated ballots changing some of the requirements of ASTM Method E23. ISO Subcommittee 4 has begun to study the results to see how they apply to the revision of their Method R442.

Prior to the Symposium, one attendee was overheard saying, "I see that there is a symposium on the Charpy test; what can be new there?" I believe that the symposium and this STP are definite statements that much is happening in the field of Charpy testing to further the understanding of what is required to obtain acceptable Charpy test results and the proper interpretation of those results.

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Thanks are also in order to the people who have been instrumental in seeing that this STP was published. These include Monica Armata, Rita Harhut, and the editors of the ASTM Staff and Jim Perrin of the ASTM Publication Committee. In addition, the original reviewers again reviewed the revised papers to insure their quality.

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Reference 1: Tobler, R.L., R.P.Reed, I.S. Hwang, M. Morra, R.G. Ballinger, H. Nakajima, and S. Shimamoto; Journal of Testing and Evaluation, Vol 19, January 1991, pp.34-40.