Hydrogen Testing

Question

Do you have any information on the correlation of results from the Electronite HYDRIS analyzer for hydrogen and the values from benchtop analyzers? We currently have a LECO hydrogen analyzer that requires a solid steel sampler. The importance of proper sampling techniques is well known to us. We are always suspicious that the sample was cooled correctly and tested in the minimum amount of time. Nonetheless, the parameters suggested based on HYDRIS measurements are significantly higher than the results we see from the LECO hydrogen analyzer. M.S. Thailand

Answer

In a paper from the 1989 Steelmaking Conference Proceedings,[1] the results from HYDRIS testing were compared to test results from dual wall hydrogen test samples run on a benchtop hydrogen analyzer. A statistical analysis on several grades of steel found that the dual wall sampler results were higher by a factor of 1.48 as compared to the HYDRIS results. The 1989 study did not compare results obtained from HYDRIS with pin samples. Statistically this study had a correlation coefficient of 0.49 which means that about 51 % of the time the results between HYDRIS and dual wall samplers were randomly related.

On the plus side, repeatability of the HYDRIS results were excellent as compared to results from dual wall samplers. Within the same group HYDRIS tests had a coefficient of variation of 4 % while dual wall samplers showed a coefficient of variation of 15%.

Furthermore the same study found that dual wall hydrogen sample results were higher than pin samples by a factor of 1.8. The authors found that the lower hydrogen values from the pin samples were attributed to the inability of the pin sample to discern high hydrogen contents due to hydrogen saturation of the steel. The HYDRIS measurements were not limited by the upper limit of 6 or 7 ppm as it was with the pin sample tests.[2] Based on

[1] P.J. Zasowski, et.al, "Application of Direct Hydrogen Measuring System for Process Evaluation," 1989 Steelmaking Conference Proceedings, Iron and Steel Society, Warrendale, PA, USA, pg. 397.
[2] Ibid.

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this analogy, and if your melt shop is using pin samples rather than dual wall samplers, perhaps your liquid steel contains high levels of hydrogen.

In your question you observed that results from the HYDRIS tests were significantly higher than results obtained from the LECO analyzer. This would be opposed to the results found in the earlier study but remember that those results were randomly related 51 % of the time. Additionally, your results could differ due to sampler type, sampling technique or LECO analyzer set up.

So which system gives the correct results? For predictability of operations, the HYDRIS system will give better process information due to its repeatability of results and very short time span between sampling and publication of results.

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