Continuous CarbTool Development

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Introduction

Heat treaters want an effective simulation tool that predicts the carburization performance of a variety of steels. A simulation tool, CarbTool, has been developed by CHTE to calculate the carbon concentration profile in the steel during the gas and vacuum carburizing process by creating an algorithm based on the finite difference method (FDM), and C++ programming in Microsoft Visual Studio. The tool is based on the concept of the carbon flux at the surface between the gas and steel, and carbon diffusion in the steel. Users input data, including the carburization temperature, time, and carbon potential in the atmosphere or flux. By using CarbTool, the heat treater can determine the carbon concentration below the surface to plot case depth according to a user-defined value.

Objectives

- This is continuous development of the previous CarbTool software
- Add the function of predicting the microhardness of as-quenched carburized case
- Add the function of predicting the microhardness after the tempering of the carburized steel

Results
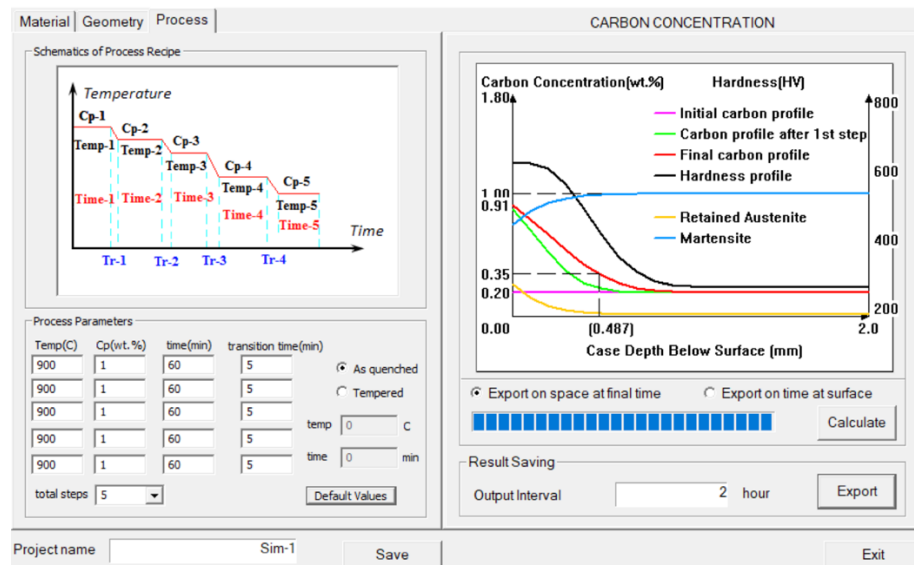
The microhardness profile in the as-quenched carburized case of steel can be calculated based on the carbon concentration profile. The microhardness profile after tempering with various combinations of temperature and time is also predicted by experimentally determining the Hollomon-Jaffe equation. Functions above have been added to previous CarbTool and new version of CarbTool 20.1 was developed successfully.