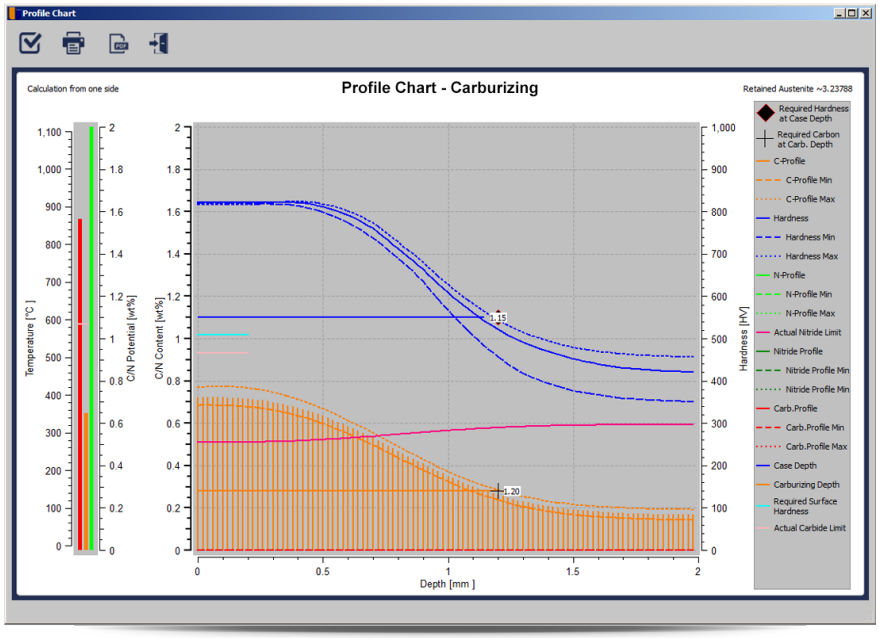
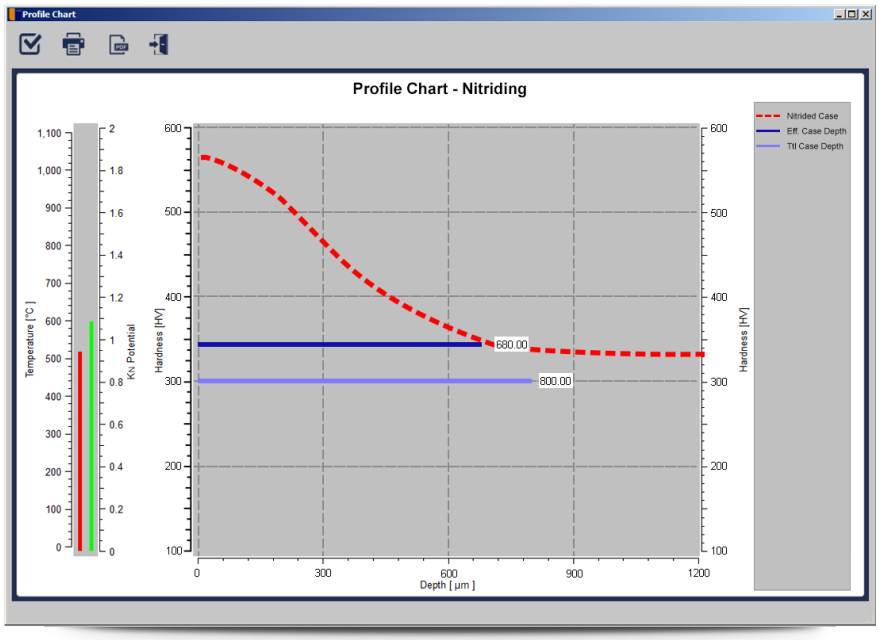
United PROCESS CONTROLS

SIMULATION SOFTWARE FOR CARBURIZING, CARBONITRIDING, NITRIDING, AND NITROCARBURIZING PROCESSES





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HT-TOOLS PRO

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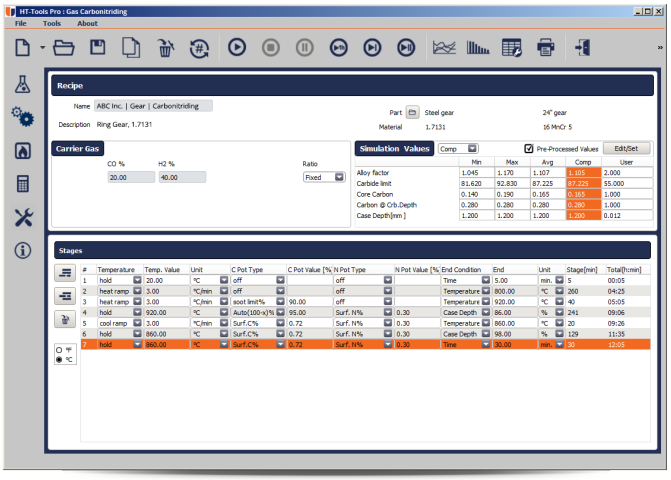

The intuitive, easy-to-use HT-Tools Pro helps users quickly get started creating, evaluating and optimizing recipes.

DESCRIPTION

HT-Tools Pro is a powerful simulation tool for designing and optimizing recipes for carburizing including low-pressure carburizing, carbonitriding, as well as nitriding and nitrocarburizing processes. It can significantly reduce the lead time for process development, replacing time-consuming evaluations and trials.

The software determines the most efficient recipe for a given application based on its specifications, which include part characteristics such as steel composition and, where applicable, design geometry as well as quench conditions, or quenched and tempered conditions for nitriding/nitrocarburizing processes. HT-Tools Pro analyzes the data entered and models the carbon and/or nitrogen content and hardness profiles. For nitriding and nitrocarburizing, the software produces models in accordance to AMS 2759/10A and 2759/12A recommendation.

HT-Tools Pro includes a materials database that can be populated with steels of various chemical compositions. Depending on the alloying elements in the steel, HT-Tools Pro calculates alloying factors and solubility limits versus carbide and nitride precipitation. Additionally, a recipe database makes it possible to store and analyze multiple recipes. The simulation of different alternatives by changing parameters allows the user to quickly evaluate a recipe so that optimal results are achieved.

CREATING/MODIFYING RECIPES

Recipes are created and modified by setting the:

- temperature in heating, holding and cooling stages;
- furnace atmosphere in carburizing/carbonitriding - specifying the carbon and/or nitrogen potentials, soot limit, carbide limit, and surface carbon content; and
- furnace atmosphere in nitriding/nitrocarburizing - specifying the nitriding and/or carburizing potentials and nitrogen dilution.

FEATURES

- Calculation of the expected hardness distribution - carbon and/or nitrogen profiles for the required case depth
- Progression of process curves with zoom options
- Profile curves of the expected carbon and/or nitrogen and hardness distribution with zoom options
- Database of recipes with automatic calculation of limits versus soot formation and carbide/nitride precipitation
- Materials database that can be populated with the chemical composition of various steels
- Possibility of accounting for a part's geometrical characteristics

HT-Tools Pro calculates

- Compound layer thickness and composition
- Diffusion (precipitation) layer
- Total diffusion depth; Effective case depth
- Nucleation
- Hardness profile with tolerances
- Carbon percentages; Surface carbon/nitrogen content
- Alloy factor; Carbide limit; Nitride limit; Soot limit
- Recommended process setpoints including K_C and K_N

BENEFITS

- Short recipe optimization time
- Faster sampling-to-production time
- Possibility of in-flight parameter modifications reduces the need for expensive testing
- Recipes can be transferred to any PROTHERM controller via the PROTHERM 9800 production management software.

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