

# 20th Century vs. 21st Century Heat Treating



## 20th Century

## 21st Century

Mostly processing at Captive or Commercial Heat Treating plants

LEAN single-piece flow, customizable for heat treating at the machining cell or forge shop

More manufacturing steps for desired net shape and mechanical properties after quenching and treating

Faster and fewer manufacturing operations (Quench2Fit™ and DFIQ™ - Direct from the Forge Intensive Quenching)

Lots of hazardous oil and expensive polymer quenchants used

More water quench and molten salt quench – less hazards from oil quenchants

Pack or Batch Carburizing for case hardened shell and fully toughened core in one step

Less time for batch carburizing or complete elimination of batch carburizing for a case hardened and properly toughened core in one-step

Good uniformity for heating rates; but poor uniformity for quench cooling rates over time and uniformity over part surface shell

Precise time and temperature controls for heating AND cooling rates and soak times

Significant distortion especially after liquid quenching that requires costly post-heat treating or at the forge operations (grinding, straightening, etc.)

Predictable part size change enables Quench2Fit™ and part modeling, customizable

High energy consumption during inefficient at the forge heating or long batch furnace or continuous furnace heating and soak times

Energy conservation during heat treating and downstream

Higher work-in-process (WIP) inventories; reheating for single-part press quench die quenching or straightening inventories

Lower work-in-process (WIP) inventories for heat treating (parts and quench fixturing)

Higher cost alloys needed for Ability to harden and achieve an acceptable balanced hardness + ductility in thicker mass parts

Same hardened depth use from lower cost alloys; higher strength AND higher ductility at the same time

Little or no “uniform atmosphere and quenching controls” for little residual compressive surface stress means higher wear and shorter part fatigue life

Added dimension of higher compressive residual surface stress means longer part life and higher power density parts

**Don't Get Left Behind!**

Visit [www.IHTS.com](http://www.IHTS.com)



Integrated Heat Treating Solutions