



The Intensive Quenching Advantage

What is One Step – Interrupted – Intensive Quenching?

The best hardening method is a one step – interrupted – intensive quenching;

- Creating high compressive surface stresses, to an optimum depth;
- Yielding the highest “super-strengthening” of the part for a given material or alloy.

Key Elements

- **Intensive surface cooling** is fast enough to eliminate the vapor blanket and nucleate boiling phases.
- The heat transfer mode is “**direct convection cooling**”
- The intensive cooling is **continuous and uniform** over the entire part surface
- **Interrupting the intensive quenching** when compressive surface stresses are at their maximum value and optimum depth.

Limitations

- These maximized compressive surface stresses will be diminished if the core of the part is cooled further, e.g., to the quenchant temperature.
- For thin parts, the required high water flow velocity and the short time to “interruption” become in many cases impractical.
- Parts of thicker cross-sections (more than $\frac{3}{4}$ ”) and parts of relatively simple geometry are ideal candidates for one step – interrupted – intensive quenching.
- It is not always possible to provide a high-velocity water flow uniformly around the entire part surface area. This is especially difficult for parts with complex geometry and batch quenching

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Process Benefits

- Integration of the heat treatment process into single part production flow lines / cells
- Reductions in component material costs
 - Smaller components / lower weight for comparable material properties
 - Leaner alloy steels for comparable material properties
- Improvement in mechanical properties
 - Yield and Ultimate Tensile Strength
 - Proof ratio with no loss in ductility
 - Finer grain size
 - Impact strength
 - Surface hardness
 - Depth of hardening
 - Wear resistance
- High residual surface compressive stresses for greater part durability
 - Service life
 - Fatigue life
- Elimination of cracking
- Minimization of distortion and associated rectification costs
- Reduction or elimination of carburization cycles
- Replacement of hazardous quench oil with more environmentally friendly water and water based solutions.

Applications

- **Improvements in service life**
 - S5 – cold work punches
 - H13 – hot work punches
- **Improvements in fatigue life**
 - 15B35 – fork-arms
 - 9254 & 9259 – automotive coil springs
 - 1040 – heavy truck output shafts
 - Pyrowear 53 – helicopter test gears
- **Material cost reductions, using leaner alloy steels**
 - Ball studs – 4140 now 1040 & 1045
 - Universal joint crosses – 5120 now 1018
 - Output shafts – 5140 now 1040
 - Die-bars – 34CrNiMo6 now S5
- **Single component manufacturing cells**
 - Automotive side pinions
 - Fork-arms

For detailed information concerning application of the IntensiQuenchSM process and equipment to your heat-treating operations, please contact us at:

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Intensive Quenching Workshops

In USA

Wednesday April 24th 2013
9-30am – 3-30pm

Hilton garden Inn & Banquet Conference Center
700 Beta Drive
Mayfield Village
Ohio 44143

Full details at: <http://intensivequench.com/>

In UK

Wednesday June 5th 2013
9-30am – 2-30pm

NOF Energy Offices
First Floor
Thames House
Mandale Business Park
Belmont Industrial Estate
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Full details at: <http://www.geoffbassociates.com/workshops>

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