

**A COMPILATION OF PAPERS AND
PRESENTATIONS
ON INTENSIVE QUENCHING
PUBLISHED AND PRESENTED
BETWEEN 1995 AND 2006**

Compiled by

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IntensiQuench® Processes for SupR-STRONG™ Parts

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PREFACE

“Intensive quenching” as we know it today began in the 1960’s with the work of Dr. Nikolai Kobasko and his colleagues in the Ukraine. From 1968 to 1995, Dr Kobasko has published over 150 papers on the subject. Dr. Kobasko’s work furthered the art of heat-treating and developed the science of the IntensiQuench® processes. **Dr. George Totten defines IntensiQuench® as “the controlled quench cooling of parts, usually in highly agitated water, so as to maximize the part’s residual compressive surface stresses; and then to interrupt that intensive cooling to minimize the part’s distortion and to preserve the compressive surface stresses.”**

In 1999, Dr. Kobasko, Dr. Michael Aronov and Joseph A. Powell formed IQ Technologies Inc, of Akron, Ohio. Since that time, the team has performed hundreds of demonstrations on thousands of parts in experimental intensive quenching systems. In 1997, Akron Steel Treating built a 6,000-gallon intensive quench tank across from a 36” X 36” X 48” radiant tube batch atmosphere furnace. IQT has successfully quenched many different alloys and part configurations; from plain carbon steels to “air hardening,” tool steels; in batch and in single part quenches. In 2002, John Vanas, of Euclid Heat Treating Company, joined IQT, and, with AFC Holcroft, built the world’s first integral, intensive quench, atmosphere furnace. This furnace is 36” X 36” X 72” and has a fully automated 12,000-gallon, intensive water quench tank

The science of IntensiQuench® is grounded in over 40 years of experimental data. In addition, the mass of real world data is supported by IQ Technologies’ proprietary software program that allows IQT to calculate with precision the precise moment or moments to interrupt the intensive quench to optimize compressive surface stress and minimize distortion.

As is shown in the following materials, the benefits of intensive quenching are well documented by IQT and dozens of end-users. Among the proven benefits of IntensiQuench® processes are the following:

- **Lower alloy and/or lower carbon in the steel yields higher as quenched hardness**
- **Deeper hardness for a given alloy or carbon content material**
- **Reduction or complete elimination of carburization cycle time**
- **High hardness AND reduction in distortion from quenching**
- **High residual compressive surface stresses without secondary operations (induction case hardening)**
- **Environmentally friendly, inexpensive water quenchant is used**
- **Parts (and the heat treat facility) stay clean**
- **Works with any through-heating method (gas atmosphere, fluidized bed, induction, or vacuum)**
- **Makes in-line, single part heat treating a viable choice**

The body of work of IQT (and others), from the period of 1995 to 2003, is compiled in this binder. From 1995 to 2003 the following journals published papers on intensive quenching:

- *Advance Material and Processes Magazine* of ASM International (USA)
- *Industrial Heating Magazine* (USA)
- *Journal of Pressure Vessels Technologies* (USA)
- *Journal of Materials Engineering and Performance* (USA)
- *Journal of Heat Treatment of Metals* (England)
- *Materials World Magazine* (England)
- *Journal of Industrial Heat Engineering* (Russia)

Intensive quenching papers and presentations were presented to the following conferences and congresses in North and South America, Europe, Australia and Asia:

- First International Automotive Heat Treating Conference (Mexico, 1998)
- ASM Heat Treating Conferences (USA, from 1998 through 2005)
- Thermal Processes Conference (Czech Republic, 1999)
- SAE Conference (USA, 2002)
- SAE Conference (Brazil, 2002)
- IFHTSE Congress (Australia, 2000)
- IFHTSE Congress (USA, 2002)
- ASME Pressure Vessel Conference (Canada, 2002)
- Conference on Quenching and Control of Distortion (China, 2003)
- Conference on Heat Treatment and Surface Engineering in the Production of Automotive Components (Thailand, 2003)
- International Scientific conference on Achievements in Mechanical & Materials Engineering (Poland, 2003)

Some of the results of intensive quenching studies were also published in two handbooks:

- *Theory and Technology of Quenching*, edited by Liscic, B., Tensi, H.M. and W. Luty, Spriger-Verlag, Berlin, 1992
- *Residual Stress and Distortion of Steels*, edited by Totten, G.E., Howes, M. and Inoue, T., ASM International, 2002

This binder consists of two Sections and Appendix. Section I resents the basics of the intensive quenching method and theory, then summarizes the results of several applications of the intensive quench process. The source of the data presented is from test data from the respective maker of the parts. This paper can be downloaded from the IQ Technologies Inc web site www.intensivequench.com.

Section II includes the papers on intensive quenching published around the world from 1995 to the present in chronological order.

Appendix includes IntensiQuench® patent No. 6,364,974 granted by the USPTO to IQ Technologies Inc on April 13, 2003, entitled “Quenching Apparatus and Method for Hardening Steel Parts”.

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