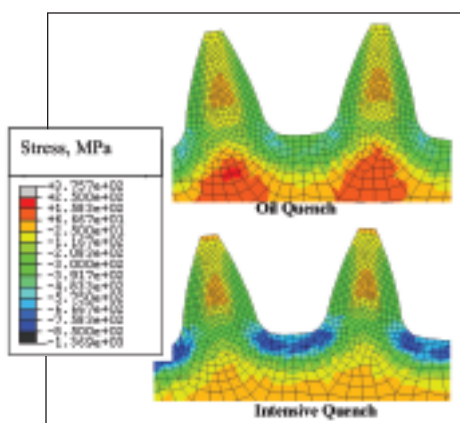




*The technical research initiatives of the Heat Treating Technology Roadmap to achieve Vision 2020 goals are many and wide ranging. While it is impracticable to have research teams working in every area, there are some initiatives that should get special attention, and could possibly come to fruition in the short term with a concerted effort, building on results that have laid the foundation.*



*Residual stress profile comparison after heat treat through tooth/root cross section. Photo courtesy of Deformation Control Technology Inc., Cleveland, Ohio.*

# VISION 2020: LOOKING AHEAD

**I**n the area of Improved Process and Materials Technology, two areas of special interest are: (1) generating the necessary materials properties databases to enhance modeling capabilities and (2) improving vacuum carburizing technology. Better use of modeling to help predict distortion and carburized case profiles at the design stage of the product could help holding the required case depths needed for the function of the part to a minimum. The heat treating process could be modeled, which would predict the distortion, and this data would help minimize the necessary grinding stock on the part. This also means the case depth is again reduced, since extra stock is not added, which reduces the cycle time and/or temperature required for carburizing.

Low pressure carburizing combined with high pressure quenching has made great strides in recent years with conventional and new materials. When vacuum carburizing is used, there is a reduction in energy use since it uses less gas and offers better process control than atmosphere carburizing. Vacuum carburizing and high pressure gas quenching technology lend themselves to increased use of process modeling. Both technologies work to reduce cycle time, reduce energy consumption, and improve first-time quality of heat treated products.

In the Energy and Environmental area, technology solutions are needed to dampen the negative effects of energy price volatility and uncertain supply. Two critical areas for research and development in the Energy area are energy efficiency and the potential use of alternate fuels. Implementation of improved, less costly heat recovery and waste heat utilization systems would reduce energy requirements for heat treating. Modifying combustion systems to include lower Btu fuels from gasification processes opportu-

nity and bio-fuels would provide greater flexibility in fuel supply. In addition, improved heat transfer through use of advanced electric and gas systems would also lower overall process energy requirements.

In the Environmental area, continued development is needed for NO<sub>x</sub> reduction and reduction in green house gas emissions. Methods to reduce waste streams and the reuse of waste byproducts will continue to be important.

In the Hardware and Equipment area, heat treating as an experienced-based technology must be changed to a substantially more structured scientific-based model, which requires that companies capitalize on the tools that are rapidly coming on stream. Modeling and simulation are transforming the capability to improve existing, and to develop new, materials (and processes). Simulation based engineering science (SBES) has the potential to drive progress in a structured scientific approach. SBES effectively and more efficiently drives, motivates, and optimizes developmental progress. These activities will help to meet increasing demand in today's industrial manufacturing environment for shorter launch times, leaner operating budgets and personnel availability, and increased system sophistication.

## Pushing for greater research activity

The HTS R&D Committee is actively pursuing paths forward to begin accomplishing some of these biggest impact areas to benefit the entire heat treating community. The fundamental reality for initiating all R&D tasks is that nothing can be accomplished without adequate funding and industrial champions. The committee has accomplished the necessary prerequisite to move forward by defining and prioritizing the needed research and technology development needs, but it is

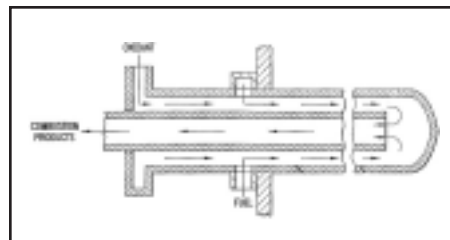
now up to our membership to help move forward.

The next step for the R&D Committee is to educate members about forming and working within a precompetitive consortium. This is a critical activity to obtain the appropriate level of management buy-in to do all of the other follow-on steps towards establishing a successful project.

A necessary part of this program development process is defining the economic drivers for companies to participate and for funding agencies to provide their resources that are very competitively sought after. These drives include return-on-investment, impact on the U.S. economy, national security, ability to commercialize, and a strong business plan. In other words, the next big step in developing successfully funded collaborations is doing a great sales job. This is going to require the buy-in and commitment of major effort (time) from our membership to do these pre-project activities. Having industrial champions who can

shoulder part of this responsibility is one way to meet this challenge. We're encouraging HTS membership and those in the broad community conducting research in heat treating related technologies to summarize their current and past projects on the CHTE Global Database so the committee can become more aware of the technology developments that could be leveraged in the committee's future program development activities. The interactive Website to list your research or learn of current efforts available to the general heat treating community is located at [www.wpi.edu/academics/research/chte/search.html](http://www.wpi.edu/academics/research/chte/search.html).

The future efforts of the HTS R&D Committee are going to be aggressively focused on achieving some of the technology needs defined in its updated roadmap as summarized in the three most recent articles published in the May/June, September/October, and November/December 2006 issues of *Heat Treating Progress*. (To review all previous articles discussing updates to the Road-map, visit



*Gas Technology Institute's patented reverse annulus single-ended radiant tubes (RASERT) offer higher heat transfer and longer tube life than conventional radiant tube designs.*

[www.asminternational.org/hts](http://www.asminternational.org/hts)).

This will not be an easy task, but will be well worth the effort for the future viability and competitiveness of the heat treating industry. The assistance, guidance, and active participation of our membership and their organizations are needed to define and develop the economic drivers essential to convince the various funding agencies to provide the monetary resources to conduct the R&D to make the Heat Treating Technology Roadmap dreams become a reality before 2020. If this doesn't happen, the roadmap will become a dead end. 