Iowa State University

MSE PARTNERSHIPS

The Department of Materials Science and Engineering at Iowa State University invites you to join in a partnership that matches resources and needs. We can help companies—large and small—make the most of the many multidisciplinary resources and centers at Iowa State. MSE faculty and students have the expertise to help you solve materials problems, develop new products, improve productivity, and increase profitability. Interactions can be confidential.

WHAT MSE OFFERS INDUSTRY

- Expertise in materials research and development
- Problem-solving skills for materials design and processing
- Facilities to synthesize, characterize, and test a wide variety of materials
- University-industrial partnering opportunities with federal and state funding agencies
- On-site or on-campus training workshops
- Access to a pool of talented students for employment
- Faculty consultant relationships

WHAT INDUSTRY OFFERS MSE

- Sponsorship of student senior design projects
- Student internship and co-op opportunities
- Faculty internship opportunities or faculty-industry exchanges
- Research partnerships
- Employment of MSE graduates
- Support for student scholarships
- Industrial Advisory Council members
- Unrestricted gifts or gifts in-kind

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Clearline Cutlery, a small business in Traer, Iowa, has been trying to break into the market for skinning blades used in slaughterhouses. For the past year, Clearline personnel teamed with MSE faculty John Verhoeven, Scott Chumbley, and Tom Lograsso to improve the composition and wear resistance of the steel blades in their Ranger line of industrial blades. Clearline, the professors, and two undergraduate MSE students worked together to develop a high carbide-low retained austenite steel blade that is more wear resistant than the market-leading industrial blade.

However, field trials with prospective industrial customers showed that the new Ranger blade still did not outperform the ordinary blades in use. Returning to the laboratory, the ISU investigators discovered the reason. As seen in the scanning electron microscope, the Ranger blades had numerous burrs and sharpening defects, which were seen much less often on the competitors’ blades. With improved attention to the quality control of the subcontracted blade sharpening procedure, Ranger blades are now positioned for major growth in the market for industrial slaughterhouse blades.

For decades the most frequently used solders have been lead-tin alloys with low melting temperatures, excellent wettability for copper wire and contact pads, and low cost. But more stringent standards for lead contamination in the workplace and in landfills prompted MSE Adjunct Professor Iver Anderson to investigate possible alternative solders containing no lead.

The tin-silver-copper system was a possible lead-free solder previously rejected because handbooks indicated that the melting points were too high. Some aspects of that phase diagram “seemed a bit fishy” to Anderson and retired MSE Professor Jack Smith. Working with Fred Yost of Sandia Laboratories, Bob Terpstra of Ames Laboratory, and student Chad Miller, Anderson re-examined the Sn-Ag-Cu system to check the diagram’s accuracy. It was incorrect; the actual melting points were much lower than published.

Anderson’s team developed a family of lead-free solders that are now marketed through licensing arrangements with Johnson Manufacturing (Iowa) and Multicore Solders (Texas). The new solders are easily applied to the work piece with the same fluxes as Pb-Sn solder and are environmentally friendly, stronger, more resistant to high temperatures, more corrosion resistant, and only slightly more expensive than lead-tin solders.

Surgeons frequently use glass fibers to direct laser beams onto body tissues. However, the conventional glass fibers used for telephone lines function poorly in surgery. When the tips of these fibers contact tissue, they are abruptly cooled, and the thermal shock of this contact causes tiny pieces of glass to break off the end. This, in turn, leaves a ragged end, which is even more prone to further damage.

Gerald Shirk, a surgeon from Cedar Rapids, Iowa, became frustrated with the poor performance of these conventional glass fibers in surgery, and he brought the problem to MSE Professor Steve Martin. Working with postdoctoral researcher Abdelouahed Soufiane and former graduate student Sheila Grant, Martin developed a process for making fibers with a type of glass that is less susceptible to heat expansion. Shirk tested the prototypes in surgery, and the final product is a safer and more reliable laser optical fiber able to withstand the rigors of surgery.

Their combined efforts were so successful that Shirk formed a company, Full Spectrum, Inc., to market the new fiber. Clinical trials are completed and the new fiber is patented, FDA approved, and in full production. When the fiber gains user acceptance, it will reduce blood loss, minimize trauma, and accelerate healing in laser surgery patients.