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STEEL DREAMS

By ERIK SHERMAN
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(FORTUNE Magazine) – In the past decade the U.S. steel industry has attracted attention less for innovation than for labor disputes, plant closings, and the looming threat of a collapse in world steel prices due to rising exports from China and India. U.S. plants still churn out everything from generic rebar to high-tech superalloys. But American producers (several of which have been acquired by foreign companies in recent years) now meet only 80% of domestic demand, vs. the near-monopoly they enjoyed in the 1970s. The steelmakers must innovate to compete with overseas producers. "They need to focus on the highest quality of production and the highest productivity," says George T. Haley, an industrial marketing expert at the University of New Haven. Fortunately, help is on the way. Here's a look at some of the most interesting and promising steel technologies now germinating at university labs and companies around the U.S.

MICROWAVE SMELTING

Not recommended for popcorn: Even in the most modern plants, steelmaking is a lengthy process. A conventional blast furnace can take eight hours just to refine iron ore into pure iron, the precursor of steel. For the past decade material scientists at Michigan Technological University have been exploring the use of microwave technology to speed steel production. Professor Jim Hwang (right) and colleague Xiaodi Huang built a prototype using parts cannibalized from half-a-dozen consumer microwave ovens they bought at a local discount store. Hwang's lab smelter works six times faster than a blast furnace to reduce iron oxide to iron. The same device incorporates an electric arc heating system that transforms the iron into steel. The smelter works well in the laboratory. Now Hwang is raising money to build a full-scale industrial prototype that could make a ton of steel in an hour for as little as half the cost of conventional production.

AMORPHOUS STEEL

Stealth metal: Steel is admirably strong and durable, but its magnetic properties are ill-suited to the stealth applications that modern militaries demand. At the University of Virginia, professors Joseph Poon and Gary Shiflet (pictured on the first page of this story) used U.S. Navy funding to create small batches of amorphous steel, a glasslike form of the metal that they claim is two to three times stronger than ordinary steel and less susceptible to corrosion. It's also non-magnetic, hence theoretically invulnerable to undersea magnetic detectors and mines detonated by magnetic fields. These qualities could make amorphous steel ideal for submarine hulls, if Poon and Shiflet can find ways to reduce the alloy's brittleness. Amorphous steel can also be heated and molded like plastic. Liquidmetal Technologies of Lake Forest, Calif., owns the commercial license for nonmagnetic amorphous steel. Within three to five years the company hopes to begin selling amorphous steel products such as armor-piercing shells, surgical instruments, and sports equipment.

QUICK-DRY COATING

Rust never sleeps: Corrosion is a major problem for all products that contain steel. Manufacturers have traditionally fought rust by either painting or powder-coating their steel products. But some of the chemicals used in coatings are environmentally hazardous, and lengthy drying and cooling times are a major manufacturing inefficiency. Ecology Coatings in Akron spent 15 years developing a nontoxic, ultrathin film coating that dries in just three seconds under ultraviolet light. It's a bit like putting your steel product on a fast-tanning bed. Ecology sells its system to

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such clients as Bill Harris (above), president of Yankee Fireplace in Middleton, Mass., which cleans and coats propane tanks like those shown. The tanks can't be overheated because of the danger of an explosion. Ecology's process reduces the energy required to dry each tank by 75%, according to Ecology CEO Richard Stromback, 36. The company recently licensed its process to DuPont for automotive applications and is in talks with other major firms.

MODULAR CONSTRUCTION

Studs of steel: Steel is a relatively uncommon material in the home-construction industry. But general contractor John Rizzotto in Stuart, Fla., has developed a modular house-framing system that incorporates stainless-steel rebar, concrete, insulating foam, and other materials. The system costs about the same as traditional materials and is designed to meet housing codes in all parts of the country. Unskilled laborers can assemble Rizzotto's components using a utility knife and a screw gun, significantly reducing construction costs. Rizzotto sells the components through a company called Innovative Structural Systems. One customer had him build a 3,000-square-foot house that features a 54-by-54-foot space with no vertical beams. Last year the building withstood hurricanes Jeanne and Frances without damage. Perhaps most tellingly, the customer owns a lumberyard.

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