

N47. NEW ALLOYS RESIST WEAR WITHOUT COSTLY COBALT

A new family of alloys, called NOREM, developed for the Electric Power Research Institute (EPRI) provides manufacturers with an alternative to the costly cobalt-based alloys used to resist wear. By eliminating the need for cobalt, NOREM could reduce the cost of making equipment more wear-resistant. Initial uses of the cobalt-free alloys will likely be in power plant valves, where operating conditions most closely resemble those used in the laboratory tests where the alloys first showed promise. In these and many other uses, wear occurs when parts rub together and fluids at high temperatures cause erosion and corrosion. In nuclear reactor applications, NOREM alloys will not become activated, which will reduce worker protection and maintenance costs. To prevent component wear, NOREM is welded or sprayed to form a thin layer over the surfaces to be protected.

Before development of these new, iron-based alloys, cobalt-rich alloys offered the best solutions for resisting wear. The new alloys were derived from Nitronic 60 (trademark), one of the few types of stainless steels that exhibit excellent resistance to wear. Researchers evaluated many different alloy combinations, subjecting each new composition to a punishing series of tests. The main goal was to develop alloys with excellent resistance to galling wear. Tests confirmed that the new alloys retained their wear-resistant properties when produced as rods and powders, the most common product forms used by welders.

Stoody Deloro Stellite, a subsidiary of Thermadyne Industries, St. Louis, MO, the world's largest producer of welding equipment and materials, was granted the first license to market the alloys; a second license was granted to ANVAL, the world's largest producer of gas-atomized metal powders. Both licensees are working on marketing plans and are offering the different product forms to interested parties. With NOREM alloys now in the commercial domain, ongoing research and development is evaluating the performance of prototype components protected by these alloys. In long-term endurance tests being performed at Atomic Energy of Canada, Ltd., welders were able to apply the NOREM alloys to power plant valves with an ease and speed comparable to the standard cobalt-based alloys. In fact, the new alloys showed an added benefit, allowing welders to avoid preheating the valves. Interim examinations show that the new alloys are performing somewhat better than the control valve coated with the cobalt-based standard. Work is also underway to develop welding parameters for wire forms that are used to repair valves that previously have been coated with wear-resistant alloys.

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