COLUMBIUM-TREATED STEELS

low-cost, high-strength

Efforts to produce high-strength, mild-carbon steels have led to the investigation of additives required for the formation of fine grain structure. Vanadium has been used for several years. Now columbium-treated steels have hit the market as a new low-cost answer.

by F. Weston Starratt

First to hit the market with columbium-treated steels is Great Lakes Steel Corp. with the announcement of its new GLX-W series. This is not the first, nor the last, that we shall hear of these steels, but Great Lakes, in an effort to diversify production and reduce dependence upon the cold-rolled sheet market, has been pushing hard and fast in this realm of low-cost, high-strength, mild-carbon steels. The object of this effort is the development of a new market for medium and light plate. Columbium-treated steel, in the form of hot-rolled plate, is expected to find such a market with the producers of welded linepipe and light structural shapes.

Largely economics

While the properties of the new columbium-treated steels may be achieved by other alloying elements, the basic factor in their present development is largely one of economics. Vanadium-treated steels, brought out several years ago by major steel producers, were also fine-grained, mild-carbon steels that could achieve many of the physical requirements of alloy steels, but at greatly reduced costs, due to the small quantities of vanadium required. Columbium now shows signs of achieving the same physical requirements at even lower costs. Ferrocolumbium itself is not excessively expensive, and additions probably on the order of 0.01 to 0.03 pct Cb so change the solidification mechanism of mild-carbon steels as to produce a fine-grained structure, characteristic of tough, high-strength steels, previously produced by costly heat treatment or alloy additions. In the mild carbon ranges of semi-killed steels, the addition of columbium can raise the yield strength as much as 20,000 psi and tensile strength by about 15,000 psi.

The new GLX-W steels, with carbon from about 0.14 to 0.20 pct and manganese at 0.40 to 1.00 pct are being produced in yield strengths up to 60,000 psi in hot-rolled plate at prices from 10 to 20 pct above those of carbon plate and considerably below the prices of alloy plate. Because of high strength, efficient design can result in a considerable reduction

in the weight of columbium-treated steel required for a given structure or in the thickness of plate demanded by a pressure vessel or line pipe. The possibility of such weight reduction means a considerable savings when the columbium treated steel is substituted either for carbon or for alloy steel plate.

Little has been said of the cold working properties of columbium-treated steels, and Great Lakes is offering it only in the form of hot-rolled plate, with its hopes largely pinned on the producers of line pipe. Columbium treated steel's high-strength, ductility, and weldability commend it particularly for this use.

Other producers coming

Great Lakes Steel Corp. may have to consolidate its position rapidly, for other steel companies have also become interested in columbium-treated steels. Republic Steel Co., for one, is reported to have worked out production problems and will shortly put its brand of columbium-treated steels on the market. The idea itself has largely been that of the Molybdenum Corp., who, seeing the success of vanadium-treated steels, has felt that columbium might do an equal or better job.

An important step

This new development of columbium-treated steels, following that of the vanadium-treated family, and perhaps even a forerunner of other fine-grained steels is, according to the best estimate from industry, an important step forward in the production of low-cost, high-strength metal by the steel industry.

W. D. MacDonnell, president of Great Lakes Steel Corp. has stated that cost savings effected by the new columbium-treated steels range up to 35 pct. "The new steels are regarded as an important metallurgical advance, because they make available, on a volume production basis, superior qualities of strength, toughness, and weldability, previously obtainable only in higher priced steels and the even more costly light metals used in many products."