A POWDER PRODUCER VIEWS TITANIUM POWDER METALLURGY

By J. F. SACHSE

Vice President, Metals Disintegrating Co., Inc., Elizabeth (B), N. J.

Weight saving—the companion piece to materials handling cost in its broadest sense—is a concept of but the recent past. In the industrial world we have to consider the relationship between the cost per pound to save a pound of weight against the over-all lifetime cost of not having spent the money to save the weight. And in all our considerations we exclude weight saving at the expense of the functional value of the article.

If an article has to be moved only once, as an electric generator delivered to a public utility, we have only freight and rigging charges to contend with. But if the article is in almost constant reciprocating motion, as the piston in an internal combustion engine, the energy tollage exacted by the excess weight is of an entirely different magnitude. If the weight is part of an article that has to haul itself around, a diesel engine, for example, we enter a new frame of reference. In the final case, if the weight is part of an article that has to lift itself off the ground, as part of the haul, we reach the presently envisioned ultimate in the importance of weight saving. For not only is the gross take-off weight the determining factor in the size of your airplane: the fuel you can carry is only determined by subtracting the net useful load of plane and passengers from the gross weight the plane can lift. Why titanium? In our opinion titanium is destined to be an airborne metal and even predominantly a military airborne metal.

It is rash to make a general statement at a time when metal technology is expanding its comprehension in such rapid cycles. The general statement that titanium has the most favorable strength-weight ratio of available materials depends for its truth on how "available" is meant. Haven't we read of single crystals of the lowly iron, when quite pure, with tensile strength of 1,000,000 psi? With vacuum melting and casting techniques of recent introduction have we not read of fatigue limits of the order of 100 percent those of conventional manufacture? Truly this is no time for a final statement.

Within rather wide limits it is probably true that the military airplane designer can buy strength-weight ratio regardless of dollar cost until his demand begins to compete for skilled production man-hours with others of like priority. The industrial designer is interested in strength-weight ratio per dollar. Between these extremes we find the commercial airplane designer who can be several times more generous with his dollars than the industrial designer but seldom can reach to the degree possible for the military airplane designer. This more or less crude evaluation of the freedom of three types of designers to buy strength-weight ratios is our basis for feeling that titanium belongs in the air and that the military will probably insist on it where its other properties, such as strength at elevated temperatures, permit its use. The same thoughts apply with somewhat less force to any portable military items, whether the porter be a man or an airplane.

What about that other property of this glamor metal—corrosion resistance? Here we believe that a continual battle will be waged between titanium and many other substances—glass, plastics, other metals, and alloys. To a much greater degree, here, milligrams lost per square centimeter per day per dollar will be much more important, tonnagewise, than mg./sq. cm./day period.

We may well be in error in this analysis and there are undoubtedly many factors at play that brought the following relationships into existence. One may be that