however, that, if high voltages are to be used, the titanium should be completely coated with platinum.

In conclusion it should be observed that these experiments have been conducted using "commercial purity" titanium. It has recently been suggested (3) that, as a result of research into the breakdown voltage of this purity titanium, anodes may shortly be available which will permit the use of higher voltages than 12 to 14 volts.

Acknowledgments are made to Mr M. Giles of Metal & Pipeline Endurance Limited for carrying out the experimental work.

References

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Anodic Corrosion Control

A NEW METHOD OF PROTECTION BY PASSIVATION

The anodic passivation of mild and stainless steels has been applied by the Continental Oil Co., Baltimore, U.S.A., to their protection from corrosion by a wide range of acids and alkalis. The process, known as the Anotrol process, makes use of the fact that when a potential is applied to a metal immersed in an electrolyte the current passed from metal to liquid suddenly drops to a very low level when a certain critical voltage is reached. This drop results from the formation of a thin insoluble film, having a high resistivity, which confers an excellent resistance to attack by corrosive acid or alkaline media. The initial current to form the film may be large, but the period for which this is required is short—a fraction of a second. Thereafter, only a very small current is needed to maintain the passivating film.

In this process, which was described by D. A. Shock and his co-workers at a meeting of the National Association of Corrosion Engineers, the steel vessel to be protected is the anode of the electrical circuit. A specially designed platinum electrode is used as the cathode. The initial passivating current and the current required to maintain protection are supplied by a potential controller employing a calomel or silver chloride reference electrode. When in operation, the required current is automatically regulated to keep the potential difference between reference electrode and the protected vessel constant. The current requirements for initial passivation and maintenance of passivity rise with increase in temperature.

Complete success has been reported in a test conducted during the past year on a stainless steel tank used in the neutralisation of sulphonic acid by 20 per cent caustic soda solution. The severely corrosive conditions to which this tank was subjected during operation caused frequent breakdowns due to pitting before the passivation process was applied. No deterioration of the tank has been found after a year's continuous use with the Anotrol system in operation.

A further advantage of anodic passivation of chemical plant is that complex contours of vessels and pipelines may be completely protected by an electrode system situated a considerable distance from areas to be passivated. A demonstration of the "throwing power" of the system is the complete protection of a 60-feet length of $\frac{3}{4}$-inch stainless steel tube, with fifteen bends, where both cathode and reference electrode were located in the acid container at one end.

Practical applications of this process have great potential value in the protection of steel plant employed for storing, processing or transporting a wide range of corrosive chemicals. Sulphuric and phosphoric acids, strong alkalis and aqueous solutions of oxy-acid salts have all been found to be suitable media.

Reducing systems, especially in the presence of halogens, cannot be used although some concentrations of halogens may be tolerated in oxidising conditions. Copper and copper-based alloys such as brasses and bronzes cannot be passivated.