

# New Anode for Corrosion Protection

## PLATINUM NIOBIUM TO BE UTILISED IN ARID ENVIRONMENTS

By P. M. Sly

Metal and Pipeline Endurance Limited, Stotfold, Hertfordshire

The protection of steel structures from environmental corrosion by means of cathodic protection systems is not new, and the use of platinum for this purpose has been reported in this journal on several occasions (1). However many factors have to be considered when designing such a system if it is to be technically and economically successful for the particular application—and in the local environment—it is intended for. This article reports the development of a new system for the cathodic protection of oil well casings and pipelines in arid environments.

As the upper strata of the earth in dry areas of the world has a high resistivity it is not practical to use conventional surface anode beds there, and for many years this problem has been overcome by installing anodes at considerable depth, within lower resistivity strata. Until the

development reported here the usual practice was to drill, and line, a hole 0.3 metres in diameter down to the static water level, which in the Middle East is found at an average minimum depth of 150 metres. Drilling would then be continued to accommodate the requisite number of anodes in order to achieve the desired current output within this lower resistivity strata. Installation costs were formidable and maintenance was difficult.

In order to produce an output of 100A, the anode column would consist of 20 conventional anodes, separated vertically by a distance of 0.5 metres. Thus the hole drilled had to penetrate typically 40 metres below the static water table, incurring substantial drilling charges. In addition, because the water downhole is not an ideal environment for these anodes, a special low resistance coke breeze slurry had to be pumped

**Typical 100 Ampere Deepwell Installation in the Middle East  
A Comparison of Platinised Niobium vs Conventional Anode Materials**

	Conventional Groundbed Materials	Platinum Clad Niobium
Borehole diameter	0.3 metres	0.15 metres
Borehole length below static water level	Greater than 30 metres	Maximum 6 metres
Coke breeze backfill	Necessary	Not required
Electrical cable	Individual cables to each anode	One cable
Maximum operating voltage	20 volts	100 volts
Maintenance	Very difficult	Easy
Life	10 to 15 years	Greater than 25 years
Present overall cost of installation	150,000 U.S. Dollars	50,000 U.S. Dollars

down the hole, to provide a lower resistivity environment for optimum anode current output and to consolidate the anode column.

Now Metal and Pipeline Endurance Limited have completed on behalf of ARAMCO, the Saudi Arabian Oil Company, the development of a new cathodic protection application for platinum clad niobium anodes in deep groundbeds. The anode consists of a solid niobium rod 12 mm diameter and clad with 0.01 mm of platinum. Again, the length of the anode depends on the required current output and they have been constructed in lengths of up to 6 metres, by resistance butt welding 1.5 metre lengths. The anode, which is enclosed within a PTFE cage to provide protection during installation, is suspended from the surface of the deepwell, and electrical contact is achieved by a chlorine resistant anode cable which is clamped to the suspension rope at intervals up to ground level.

These platinum clad niobium anodes only require a drilled hole 0.15 metres in diameter, and for an equivalent capacity of 100A an

anode length of 6 metres is satisfactory. As a result, the overall drilling costs are of the order of one third of those for drilling conventional deepwell groundbeds. In addition the basic cost of the platinum clad niobium assembly is approximately one fifth that of current deepwell anode assemblies.

Apart from basic cost savings, several other advantages result from the use of platinum clad niobium anodes in deep groundbeds. These are summarised in the Table but it is worth noting that a platinum clad niobium assembly requires only minimal equipment for its installation, removal and maintenance, and does not require the purchase or installation of expensive, special grade coke backfill.

A minimum working life of twenty-five years is expected for these new platinum clad niobium anodes which, it is anticipated, will ultimately replace all conventional deepwell anode materials.

#### Reference

- 1 Most recently, L. L. Shreir, *Platinum Metals Rev.*, 1965, **12**, (2), 42-45; 1977, **21**, (4), 110-121; 1978, **22**, (1), 14-20

## The Crucial Importance of the Platinum Metals

**Platinum Group Metals—Ontario and the World, Ontario Mineral Policy Background Paper No. 7, BY THOMAS PATRICK MOHIDE, 162 pages, \$25**

The production in some form or another of 18 per cent of all manufactured goods depends upon the use of platinum catalysts. The world has more food to eat and more fuel because of platinum, and our modern concerns with pollution control, energy conservation and the conquest of disease are directly served by the platinum group metals.

These are only three of the conclusions drawn in this comprehensive report prepared by the Director of the Mineral Resources Branch in the Government of Ontario's Ministry of National Resources.

Ontario is the world's third largest producer of the platinum metals after South Africa and the Soviet Union and there is a distinct element of political thinking in the approach to the subject. Despite this the review gives a valuable over-all perspective of world production and consumption statistics as well as a view of future demand, in which a very substantial

increase is foreseen by the end of the century.

After a description of all six metals of the group they are taken individually, each chapter detailing the characteristics and applications of one metal. For many readers this part of the report will be the most useful and stimulating as Dr. Mohide has been at considerable pains to cover every form of use known to technologists in industry, from the oldest established applications to the most recent developments. The crucial importance of the platinum metals to the well-being of mankind is made abundantly clear in these sections of the report.

Readers of *Platinum Metals Review* will of course have a much deeper knowledge of their own particular area of use of the platinum metals, but none the less a great deal of interesting information has been brought together here.

The report is available from the Ontario Government Bookstore, 880 Bay Street, Toronto, Ontario, Canada. L. B. H.