fast installation, tolerance of thermal expansion, stability on removal, and they facilitate secure storage during long shutdown periods.

Folding Catchment Gauze Packs

Larger packs inevitably take a significant time to unpack and install, and secure storage can be a problem due to their size. In the search for even higher noble metal recoveries, catchment packs are tending to contain greater amounts of gold-palladium than in the past, necessitating secure storage during shutdowns. Such considerations, coupled with the increasing cost of downtime, led to the concept of using what are effectively a number of small 'biscuit' packs in large reactors (6). A variety of solutions was possible but the preferred method at present is to divide the pack into four separate quadrants hinged together by heat resistant steel wire. By folding the quadrants in a given sequence, shown in Figure 4, it is possible to deliver a large ready made 'biscuit' pack in a case not much larger than a quarter of the area of a normal pack, see Figure 5. Storing and carrying such a pack in a restricted space is now possible, while installation, which is shown in Figure 6, and removal from the reactor is both simple and rapid, and operator reaction to the system has been very good. In addition, the quadrant form is ideal for air cargo transportation since the majority of sizes fit standard cargo hold dimensions.

The folding catchment gauze pack concept was originally conceived to enable rapid installation and removal, and safe storage, without damage to the gold-palladium gauzes. However, operational experience has shown other advantages. The ability of the independent segments to accommodate the slight catalyst bed distortions and minor movements between support gauzes, which generally occur in large reactors as the campaign proceeds, has resulted in far better support for the gold-palladium gauzes. As a result noble metal losses due to attrition appear in a number of cases to have been reduced.

The better support offered by this system will be of even greater value if catchment gauzes of lower gold content are developed. When the technology was first introduced 20 per cent gold-palladium was the optimum material, when considering both strength and recovery efficiency, but the improved support systems now available may permit a reduction to be made in the gold content, to the benefit of the economics of the process.

References

1 H.Holzmann, *Chem.-Ing.-Tech.*, 1968, **40**, (24), 1229
2 H. Holzmann, *Platinum Metals Rev.*, 1969, **13**, (1), 2
3 A. E. Heywood, *Platinum Metals Rev.*, 1973, **17**, (4), 118
4 *Nitrogen*, January/February 1980, (123), 34
5 Op. cit., (Ref. 3), p. 124
6 *British Patent Appl.* 2,050,189; 1981

Tungsten-Osmium Alloys for Improved Cathodes

Progress in cathode research was reported at the second Tri-Service Cathode Workshop held last year at the Rome Air Development Center, New York. Selected papers were later published, and in one of these the authors M. C. Green, H. B. Skinner and R. A. Tuck of EMI-Varian Limited at Hayes, Middlesex, presented studies of tungsten-osmium alloys and their relevance to improved M-type cathodes (*Appl. Surf. Sci.*, 1981, **8**, (1 and 2), 13–35).

When half the emitting area of a B-type cathode was sputtered with osmium the coated area performed as M-type, and the expected difference in the work function of the two parts was observed. However an interfacial band gave enhanced emission, and was of obvious practical interest. Mixed matrix cathodes were prepared from 80 tungsten-20 osmium sintered compacts impregnated with barium calcium aluminate. Initially these gave disappointing results but after 500 hours the performance became most promising, the zero field emission being some 50 per cent better than M-type.

A definite correlation between the formation of the tungsten-osmium σ intermetallic phase and the improved emission has been demonstrated. As a result an improved dispenser cathode has been constructed.

Experimental work is continuing to determine the mechanism of emission enhancement.