

VANADIUM

By Peter S. Mitchell

Highveld Steel and Vanadium Corp. Ltd

The steel industry had a very mixed year in 2001. Production worldwide was down by only 0.7% to 823.9 Mt. However, this was due mainly to an 11.9% increase in production in China and, consequently, significant reductions in production in North America, Europe and elsewhere in the developed world were masked. Against this background consumption of vanadium is estimated to have been equivalent to 70,800 t V_2O_5 . Within this figure it should be noted that consumption in the Western economies was lower than in 2000 whilst that in China increased.

While consumption of vanadium remained reasonably strong, prices were very disappointing. The price of V_2O_5 started the year weak at US\$1.35/lb, climbed to US\$1.47/lb in July and then commenced a decline to US\$1.12/lb by the end of the year. The price of ferro-vanadium followed a similar trend, commencing the year at US\$7.98/kg V, reaching a peak of US\$8.70/kg V in June and then declining to US\$6.30/kg V by the end of the year. The main reason for the poor price performance was oversupply. As a result, the industry as a whole, had a poor level of profitability in 2001.

Supply

During 2001, South Africa supplied 42.4% of the world's primary vanadium units and remains the world's largest source of such units.

The world's leading supplier of primary vanadium, Highveld Steel and Vanadium Corp., continued to manufacture vanadium containing slag, V_2O_5 , vanadium chemicals and ferro-vanadium at its plants at Witbank. In the course of the year Highveld completed the modernisation of No.1 kiln and formalised its alliance with Vantech (VRB), to exploit the vanadium battery. In conjunction with Nippon Denko and Mitsui it also announced a feasibility study of the production, in South Africa, of ferro-

vanadium for the Japanese market. Highveld also continued to supply vanadium containing slag, equivalent to about 8% of world consumption, to Vametco, the Stratcor subsidiary, at Brits, thus replacing the equivalent of Vametco's mined ore. Vametco continued to produce nitrided vanadium at Brits.

The other major supplier of primary vanadium units in South Africa, Xstrata, operated its Vantech and Rhovan plants at around 70 - 80% capacity, reflecting the effect of bringing its Australian mine, at Windimurra, into production during a period of oversupply. The move of its ferro-vanadium producing capacity from Vantech to Rhovan was completed, resulting in a significant increase in ferro-vanadium production. Xstrata also commenced producing vanadium chemicals during 2001.

While weakness of the rand undoubtedly helped South African producers to be price competitive in exports, the year ended with an anti-dumping action being filed by the US Ferroalloys Association on behalf of a consortium of its member companies in the US. This action specifically named both Highveld and Xstrata, as well as imports from China. A final judgement is expected during 2002.

Although North America was one of the main vanadium consuming regions during 2001 it only produced 10.4% of the world's supply of primary vanadium units. In the US, Shieldalloy Metallurgical Corp. ceased melting operations of aluminium master alloys at Newfield NJ. In the relatively poor market in the US it also introduced two production pauses and was reported to be operating at 75% capacity. Stratcor announced that it was joining forces with International Speciality Alloys (ISA) to form a third full-line source for master-alloys for the titanium industry. It was predicted that this alliance would allow more effective competition

with Reading Alloys, in the US, and Gesellschaft für Electrometallurgie, in Germany.

Elsewhere in North America interest continued to be shown in the Lac Dore project in Quebec, despite the serious oversupply which exists. The main producers of vanadium pentoxide in North America remain CS Metals and Gulf Chemical and Metallurgical Corp. Bear Metallurgical Corp., Masterloy and Shieldalloy remain the main producers of ferro-vanadium. Reading Alloys Inc. now joined by the Stracor/ISA alliance, manufactures vanadium-aluminium master alloys.

In Europe the only producer of primary vanadium units is Orbit Metallurgical, near Harwich in the UK. Nikom in the Czech Republic, Sadaci in Belgium and Treibacher Industrie in Austria all continue to manufacture ferro-vanadium while GfE, the Metallurg subsidiary, in Germany, continues to manufacture vanadium chemicals and vanadium-aluminium master alloys. Eastlink Lanker, which has a major shareholding in Vanady Tulachermet in Russia, tested production of ferro-vanadium at its Ferro Alloys and Metals plant, at Glossop, in the UK.

The Russian Federation was responsible for 15.9% of the world's supply of primary vanadium units in 2001. Nizhny Tagil and Chusovskoi remain the main producers of vanadium-containing slag, while Chusovskoi and Vanady Tulachermet are the main producers of vanadium-containing products.

Australia, China and the other countries of the Far East were responsible for just under 30% of the world's supply of primary vanadium units. During the year, the Xstrata plant, at Windimurra, was reported to be heading towards producing vanadium pentoxide at full capacity. In China, Panzhihua Iron and Steel (Group) Co. remained the largest producer of both vanadium pentoxide and ferro-vanadium, and was reported to be cutting back on ferro-vanadium for export while concentrating on manufacture for home demand. Also in China, Jinghou Ferro-alloy Co. reported that its plant

was running at approximately 50% of capacity. In Japan, Awamura Metal Industry, a subsidiary of Mitsui, announced that it would cease manufacture of ferro-vanadium at the end of October, citing poor prices and a climb in imports, especially from China. Other producers in Japan are expected to continue to recover vanadium from residues and spent catalysts, and the supply of vanadium-containing slags continues from New Zealand.

Uses of Vanadium

The steel industry continues to consume around 85% of vanadium produced. It is used in a wide range of steels which encompass everything from HSLA steels to tool steels and includes linepipe, structural steels, heat-treated steels, as-forged steels, reinforcing bar and rail steels. Continuing the trends of recent years, significant quantities of vanadium have been consumed in various types of steels used in automobile manufacture in both Europe and Japan while in the US the thin slab casters provide useful consumption. In China, recent changes to the design codes for construction of high-rise buildings have led to an increase in vanadium consumption in reinforcing bar.

Vanadium is also consumed in Ti-Al-V alloys for aerospace applications. While this has been an area of growing consumption, the events of September 11, 2001 have put a short term break on the market. The use of vanadium as catalysts and pigments continues. Its use in the vanadium reduction-oxidation (redox) battery is expected to grow and a plan to install a 2MWh commercial unit, in Utah, in the US, has been announced. In this respect, several small batteries are now installed and are either being tested or are in operation.

Development work on the use of vanadium continues to be supported by Vanitec, the vanadium industry's technical committee. Recent projects have included steel for thin slab casting, seamless tube, linepipe, spring steels, hard materials, hot rolled strip, grain refinement using vanadium and weldability.