VANADIUM

By Peter S Mitchell
Highveld Steel & Vanadium Corp Ltd

For the steel industry, 2000 was a record year, with world production of steel up by 7.4% to 828.5 Mt, although it should be noted that there were indications of a deterioration in the fourth quarter, particularly in the US. With its major customer doing well it is no surprise that the vanadium industry also had a record year. Consumption has been estimated to be equivalent to 146 million lbs V_2O_5, up by about 12% on the previous year.

This very buoyant picture of consumption was, however, not matched by price. The price of V_2O_5 commenced the year at US$1.27/lb, rallied to reach a peak of US$2.65/lb in early March before commencing a decline to US$1.38/lb by year end. Ferro-vanadium followed this trend commencing the year at US$7.55/kg contained vanadium, rallying to reach a peak of US$13.15/kg in early March before declining to US$7.98/kg by the end of the year. The main reason for this dismal price performance was oversupply in the market.

Supply

South Africa continued to be the world's main producer of primary vanadium units and was responsible for 41% of world supply of primary vanadium units, down approximately 5% on 1999, reflecting increasing supplies from Russia and the Far East. During the year, Highveld Steel and Vanadium Corp., the world's leading supplier of primary vanadium units, continued to produce vanadium-containing slag, vanadium pentoxide and ferro-vanadium from its plants at Witbank. Highveld also announced plans to develop the vanadium redox battery in Africa, in alliance with Vanteck (VRB) Technology, of Canada.

Highveld supplied vanadium-containing slag, equivalent to 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.

Xstrata, the owner of both Rhovan and Vanadium Technologies, announced a 19% cut in output in the first half of the year, as a contribution towards reduction in world oversupply. Rhovan's new 1,000t/mth capacity, aluminothermic ferro-vanadium converter was commissioned in mid-year. Elsewhere in South Africa, Pinnacle Resources of Denver, Colorado, acquired a 30-year lease on undeveloped vanadium resources on Lebowa trust land, near Potgietersrus in South Africa's North West Province. Pinnacle is reported to be considering the possibility of producing 4,000t/y of ferro-vanadium at this site.

North America is one of the main vanadium-consuming regions and in 2000 it produced 10% of the world's primary vanadium units, down over 2% on 1999. During the year, CS Metals, a joint venture between Stratcor and CRI International for the recovery of vanadium and molybdenum from spent catalysts, commenced operation at Convent, Louisiana, replacing an older plant at Braithwaite, Louisiana. Interest continued to be shown in the Lac Dore project, in Canada. This project, which is a joint venture between Soquem (20%) and McKenzie Bay Resources (80%), was reported to have reserves of 5 billion lb (2.27 Mt) of V_2O_5, with an average head grade of 0.5% V_2O_5. It was noted that Metal Ferro-Alloys GmbH (MFT), of Germany, had guaranteed the annual purchase of 1.2 Mlb V_2O_5 from Lac Dore, effective for 10 years from the first date of production with automatic ten-year extensions. No go-ahead for this project has yet been reached.

Meanwhile, it was also announced in North America that the US International Trade Commission was to proceed with a full review of the anti-dumping duty on ferro-vanadium and nitrided vanadium from Russia, with a view to reporting by May 15, 2001. However, the US Department of Commerce stated in October that it had decided to leave the anti-dumping duties in place. The main producers of vanadium pentoxide in North America remain Gulf Chemical and Metallurgical Corp. and Stratcor now joined by CS Metals. Bear Metallurgical Corp., Masteralloy and Shieldalloy remain the main producers of ferro-vanadium as do Reading Alloys Inc. for aluminium-vanadium master alloys.

Orbit Metallurgical, near Harwich in the UK, continues to be the only producer of primary vanadium units in Europe. 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 aluminium - vanadium master alloys. During the year, the operational assets of Treibacher Industrie were acquired by the German industrialist August van Finck. Additionally, Eastlink Lanker plc, the major shareholder in Vanady Tulachermet in Russia, acquired the assets of Ferro Alloys and Metals Ltd, of Glossop, in the UK, and announced plans to investigate the possibility of producing ferro-vanadium (80% vanadium) at that site.

Reflecting improving conditions, the Russian Federation produced 16.7% of the world's primary vanadium units, up 2% on 1999. Nizhny Tagil and Chusovskoi remain the main producers of vanadium-containing slag while Chusovskoi and Vanady Tulachermet are the most important producers of vanadium-containing products. During the year, Vanady Tulachermet commenced production of ferro-vanadium (80% vanadium) at a rate of 120 t/mth, 20 t/mth of which is for home consumption, the remainder being exported. This is in addition to the 150 t/mth ferro-vanadium (50% vanadium) produced at Tula. Towards the end of the year UGMK, Russia's second largest copper producer, announced plans to construct equipment to produce vanadium pentoxide at its Svyatogor blister copper plant in the Sverdlovsk Region. The main feedstock for the plant will be vanadium-containing slag from Nizhny Tagil, which uses beneficiated iron ore from UGMK's mine at Kachkanar as feedstock for it's blast furnaces.

The Far East, including Australia and China, was responsible for over 30% of the world's supply of primary vanadium units, up 5% on 1999. This reflects increasing supply from both Australia and China. Panzhihua Iron and Steel Co., based in Sichuan Province, China, maintained its position as the region's largest producer of both V2O5 and ferro-vanadium. Xstrata continued to build up production at its new V2O5 plant at Windimurra in Western Australia, and towards the end of the year was reputed to be well on its way towards achieving its capacity of 17 Mlb/y. During the year PMA, the original developer of the Windimurra deposit, sold its remaining shareholding to Xstrata, citing low prices. Elsewhere in Australia, interest in both the Balla Balla and Julia Creek projects seems to be declining as a result of low prices for V2O5 and ferro-vanadium. Supply of vanadium-bearing slags continues from New Zealand steel, as does the recovery of vanadium from residues and spent catalysts in Japan.

Uses of Vanadium

About 85% of vanadium consumed is used by the steel industry to manufacture high-strength low alloy (HSLA) steels (including linepipe) structural steels, heat-treated steels, tool steels, as forged steels and rail steels. It is of particular note that in both Europe and Japan significant quantities of vanadium were consumed in steels for the automobile industry while in North America the new thin-slab casting plants continued to provide a boost to consumption.

Vanadium is also consumed, in significant amounts, in Ti-Al-V alloys for the aerospace industry and in a range of chemical applications including catalysts and pigments.

Perhaps one of the more interesting areas for future growth consumption is in the vanadium reduction-oxidation (redox) battery. Work on this has been carried out in Japan for a number of years and within the past year trials in both South Africa and San Diego, US, have been reported.

Development work on HSLA steels, including linepipe and steel for thin-slab casting, reinforcing bar, seamless tube, spring steels, hard materials and weldability continues to be supported by Vanitec, the vanadium industry's technical committee.