A.4 NON-FERROUS SMELTERS

In Canada there are a total of five copper smelters, three nickel-copper smelters, two lead smelters and three zinc smelters. The major sources of smelter SO_2 emissions in Canada are copper and nickel smelters located in Manitoba, Ontario and Quebec.

In the United States, there are a total of 15 copper smelters, 5 lead smelters and 5 zinc smelters. The major non-ferrous smelting capacity is located in the Western U.S. with the largest concentration in the Arizona-New Mexico area.

In 1980, SO_2 emissions from non-ferrous smelters contributed about 45% of the total in Canada and 6% in the U.S.

Off-gases from non-ferrous smelters basically fall into two categories, those with strong SO_2 strengths (defined as greater than 4% SO_2) and those of weak strengths (less than 4% SO_2). Strong gas streams can be controlled by using add-on technologies such as acid plants and liquid SO_2 plants. These processes are considered proven and, in most cases, affordable control options. While the treatment of weak gas streams constitutes a more difficult and costly problem, control options are available. These include:

(1) the use of either regenerative or non-regenerative flue gas desulfurization (FGD) processes;

(2) the modification of furnaces to produce a strong gas stream through measures such as oxygen enrichment;

(3) the replacement of sources emitting weak SO_2 streams with alternative modern technology producing strong SO_2 streams, controlled by acid plants.

FGD is practiced by a number of smelters world-wide and each system is unique to its smelter. This is a result of the particular circumstance of each application in terms of the cost for raw materials and the availability of by-product markets rather than technical suitability of the processes.

Upgrading of existing furnace operations to strengthen sulfur dioxide content can be an effective approach to SO_2 control when coupled with FGD systems. Alternative pyrometallurgical processes are of interest because they provide a strong SO_2 gas stream for control by a conventional acid plant, reduction in energy consumption, reduction in gas stream volumes, and reduction in operating costs.

Hydrometallurgical processes eliminate the generation of SO_2 streams. However they are more energy intensive and currently have limited application. A large number of alternative approaches to achieve reductions in SO_2 emissions based upon