A COMPARISON OF HYDROMETALLURGICAL AND ATOMIZED POWDERS IN ROLL COMPACTION

M.A. Clegg, M.J.H. Ruscoe, R.W. Fraser

Sherritt Gordon Mines Limited, Fort Saskatchewan, Alberta, Canada.

Introduction

This paper presents observations made during operation of the roll compacting mill at Sherritt Gordon Mines in Fort Saskatchewan, Alberta, Canada. Sherritt operates a refinery with a production capacity of 16,000 t/a nickel powder of which 5000 - 6000 t/a is converted to strip by roll compaction for use in the coinage and electronics industries. The remaining powder production is used to make a compacted briquette for melting applications or as a powder for special industrial powder metallurgy uses. About 700 t/a cobalt powder is also produced. These hydrometallurgical powders are produced by leaching nickel sulphide concentrates in an ammoniacal ammonium sulphate solution followed by pressure hydrogen reduction.(1) The latter step causes elemental nickel to precipitate onto seed particles until the solution is spent and decanted where-upon fresh solution is admitted and the sequence repeated until the particles grow to the desired size. During the particle growth cycles specific organic compounds may be added to control the particle surface morphology.(2) The decanted solution is treated to precipitate cobalt in a similar manner.

Sherritt has a second powder making facility that utilizes the atomization technique. Here, nickel, nickel alloys and cobalt alloys are induction melted and then teemed vertically through a ceramic nozzle. The metal stream is impacted by high pressure water jets angled downwards that break up the stream into droplets which freeze into discrete powder particles. The particle size and shape are controlled by such factors as water pressure, water flow rate and jet impact angle.

Both these types of powder are produced and roll compacted on a regular basis and it has been found that different compacting parameters apply to and different strips result from the two powders. These differences are related to the physical characteristics of the powders and form the basis for the discussion that follows.