good economic efficiency and social efficiency have been obtained. The Beijing smeltery adopted mineral separating method to recalim zinc, copper, iron and so on. The recovery of Zinc and copper are 81.3% and 85.5%, respectively. Furthermore, this technology successfully solves the equipment corrosion.

4. Mechanical/physical recycling process

4. 1. Screening

Screening has not only been utilized to prepare a uniformly sized feed to certain mechanical process, but also to upgrade metals contents. Screening is necessary because the particle size and shape properties of metals are different from that of plastics and ceramics.

4. 2. Shape separation

Shape separation techniques have been mainly developed to control properties of particles in the powder industry (Furuuchi and Gotoh, 1992; Ohya *et al.*, 1993; Furuuchi *et al.*, 1993; Furuuchi and Gotoh, 1988). The separation methods were classified into four groups by Furuuchi (1992). The principles underlying this process makes use of the difference: (1) the particle velocity on a tilted solid wall, (2) the time the particles take to pass through a mesh aperture, (3) the particle's cohesive force to a solid wall, and (4) the particle settling velocity in a liquid. Shape separation by tilted plate and sieves is the most basic method that has been used in recycling industry (Koyanaka *et al.*, 1997; Gungor and Gupta,1998).An inclined conveyor and inclined vibrating plate were used as a particle shape separator to recover copper from electric cable waste(Koyanaka *et al.*, 1997). printed circuit board scrap (Gungor and Gupta, 1998), and waste television and personal computers in Japan (Owada *et al.*, 1997).

4. 3. Magnetic separation

Magnetic separators, in particular, low-intensity drum separators are widely used for the recovery of ferromagnetic metals from non-ferrous metals and other non-magnetic wastes. Over the past decade, there have been many advances in the design and operation of high-intensity magnetic separators, mainly as a result of the introduction of rare earth alloy permanent magnets capable of providing very high field strengths and gradients.

An intense field magnetic separation is achievable at least for the following three alloy groups (Klaus, 1992):

• copper alloys with relatively high mass susceptibility (Al multi-compound bronze);

• copper alloys with medium mass susceptibility (Mn multi-compound bronze, special

brass);

• copper alloys with low mass susceptibility and/or diamagnetic material behavior (Sn

and Sn multi-compound bronze, Pb and Pb multi-compound bronze, brass with low Fe

content).

4. 4. Electric conductivity-based separation

Electric conductivity-based separation separates materials of different electric conductivity (or resistivity). There are three typical electric conductivity-based separation techniques: (1) Eddy current separation (ECS), (2) corona electrostatic separation, and (3) triboelectric separation (Meier-Staude and Koehnlechner; 2000; Schubert and Warlitz, 1994; Higashiyama and Asano, 1998; Van Der Valk *et al.*, 1982; Stahl and Beier, 1997).

4. 4.1. Eddy current separation

In recycling of WEEE, the use of the traditional Eddy current separator is limited, due to the size of feed required. Particles greater than 5mm in size or, even 10mm are needed(Rem *et al.*,1998).In recent years, there have been some development of Eddy current separation processes designed to separate small particles (Norrgran and Wernham, 1991; Rem *et al.*, 2000; Rem *et al.*, 1999; Zhang *et al.*, 1999; Rem and Zhang, 1999; Fletcher and Gerber, 1994; Schlett *et al.*, 1999).Understanding the interaction between the separator field and conductive particles is essential to provide a theoretical foundation for this novel design.

Schlömann (1975) and van der Valk *et al.* (Schubert, 1991; Braam *et al.*, 1988; van der Valk *et al.*, 1998) developed a theoretical model to calculate the magnitude of the forces exerted on small block-shaped particles in magnetic fields with periodical variations. These particles are pieces of wire with diameters between 0.2 and 4mm and with lengths mainly between 3 and 10 mm. The particles sizes by screening and calculation correspond