

# Wastes of Electronic and Electric Equipment (WEEE) recycling system in Vietnam: A case study on copper recycling

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## 1. INTRODUCTION

Together with the development of the economy, Vietnam now has to face with the increase of WEEE from vary sources. Due to the lacking of experience, capital, law and technology, the country almost has no WEEE treatment system in the large scale except dumping and the small metal recovery activity. Craft village is the most important factor for the WEEE collecting and recycling process in Vietnam now, especially for the printed circuit board (PCB)

## 2. METHODOLOGY

In this study, a craft village named Long Thuong, in Dai Dong commune, Van Lam district, Hung Yen province, 40 km from Hanoi in the East, where people continue to recycle copper for more than 60 years, was chosen for a case study. The village had casted and processed some copper parts for a machinery manufacturing industry, before. The most of the products are brass (copper-zinc alloy). The production capacity reaches 120 tons or around 400,000 USD per year.

The samples for element analysis were taken from two different batches. The specimens are classified into two categories according to the quality. The specimen called high quality sample is taken from the middle layer of the copper pot and the low quality sample from the bottom layer. For the element analysis, scanning electron microscopy with energy dispersed X-ray spectroscopy (SEM/EDX) was used.

## 3. RESULT AND DISCUSSION

The results of element analysis of each sample by weight percents.

	Cu	Al	Si	Pb	Sn	Fe	Zn
HQ1 from the 1st batch	83.67	0.68	0.54	1.52	1.10	0.49	9.82
HQ2 from the 1st batch	83.17	0.72	0.62	1.51	1.85	0.80	9.27
HQ3 from the 2nd batch	85.44	ND	0.38	2.29	2.35	ND	9.54
HQ4 from the 2nd batch	85.18	ND	0.79	3.39	1.77	ND	8.87
HQ1 from the 1st batch	81.96	0.88	0.97	1.66	1.56	0.54	9.09
HQ2 from the 1st batch	81.26	0.12	1.02	3.07	1.10	2.05	8.95

*HQ: high quality sample, LQ: low quality sample, ND: not detected*

Tin concentration of the recycled products is used for the solder indicator and thus the PCB parts indicator. Assuming that the origin of tin is only solder in the PCB and the content of tin in the recycled cooper is 1.7 wt %, the maximum amount of the recycled PCB is estimated. Scince 1,500 - 2,000 ton/year of cooper is recycled by the craft villages in Vietnam, the maximum 1,300 - 1,700 ton/year of the PCB is supposed to be recycled in the craft villages. It is estimated of about 21,000 - 27,000 tons of WEEE was defined as the treatment capacity of all copper craft village in Vietnam. This amount equals to about 570,000 - 730,000 units of the three main kinds of house appliance including refrigerator, color television and washing machine.

Even the treated amount is still small, but the recycling system in craft village will be the inportant contribution to the WEEE tratment system in the near future, since Vietnam does not have the large scale recycling system of WEEE. Since the estimated data in this work is included many uncertainties, further investigation should be carried out to clarify the materials flow concerning WEEE. Finally, it is pointed out that the proper treatment of exhausted gas and water is needed for the environment and for the worker's health and the well-equipped recycling factories should be constructed.