

CHAPTER 1



INTRODUCTION

1.1 Statement of problem

Thai economy had achieved a successful development with considerable economic expansion since 1986, including high export growth and excessive investment. The industrial section had been established in many industrial activities and huge volume. The increased industrial activities introduce more employment, income growth and technology development, which help improve the quality of life of the people. However, each industry generates several pollutants, which could affect the environmental quality and condition of life.

Toxic or hazardous waste from industry has a huge quantity. This problem is currently an important issue locally and globally so all section including government, industry, NGO, etc. try to find out the best solution. Industrial hazardous waste reduction or waste minimization program is right now one of the waste management categories. The waste minimization program, which is including pollution prevention, reuse-recycle, can reduce waste volume, get benefit from the waste such as being raw material, reduce energy, etc.

Steel mill is a basic industry of developing and also developed countries. In Thailand, most of steel mills are rolling mills - hot rolling and cold rolling mills. Steel industry normally links with several industries such as the automotive, auto-part, electric, electronic, packaging and construction industries. Steel consumption in domestic increases rapidly which was 2 million tons of steel

demand in 1985 and the demand had risen up to more than 10,000,000 tons in 1996. The demand for iron and steel was 8.5 million tons in 2000, showing a small progress since the economic crisis in 1997. However, the gap between demand and supply is considered high, with current production capacity per year at 20 million tons.

The important competitor is foreign steel production plants, which have a lot of advantages than domestic's plants because the foreign plants are integrated steel mills and produce large quantities. The integrated steel mills produce by refining iron ore in several steps and produce very high quantity steel with good controlled of chemical compositions to meet all product quality requirements.

According to the topic, more than 20,000 tons/year of oily sludge, which is generated from wastewater treatment plant in all hot rolling and cold rolling mills in Thailand. Generally, rolling sludges consists of oil, grease, water and fine-grained solid. The iron content of rolling mill sludge typically varies from about 30 - 60% iron, moisture content can range 20 - 50% and oil content can range from 1.5 - 30%.

Sludges from hot and cold rolling treatment plants often are landfilled which is the "no alternative" method. Limited amounts of rolling sludge have been used as sinter plant feed. Generally, the recycled rolling sludge can be not used in the sinter plant feed because of contained oil. [U.S. department of Energy, 1998].

1.2 Objective

There are two major objectives of this paper. The first objective is to determine oil extraction from oily sludge, which generate from de-watered process in hot rolling and cold rolling mills with microwave assisted-extraction method. The

second objective is to study the characteristics of extracted oil and obtained fine iron sludge for recycle.

1.3 Scope of Study

Sample of this problem is called “oily sludge” generates from de-watered process in wastewater treatment operation in rolling mills. The representative sludges are taken from ready to landfill form without polymer or additive consideration. The selected rolling mills are the famous hot rolling and cold rolling mills in Thailand for two factories in each rolling type.

This study is industrial waste management tissue by recycling in laboratory scale. First step of experiment, the oily sludge will be extracted to two phases. The selected extraction method is microwave extraction, a new effective technique for extract liquid out from solid phase. Then, study obtained solid phase utilization to analyze characteristic for steel - re-melt and extracted liquid phase also analyzes characteristic for secondary fuel in cement kiln.

1.4 Expected Benefit

1.4.1 Environment

Industrial hazardous waste reduction or waste minimization program is one of the significant waste management categories. Recycling is an option of waste minimization program not only reduces waste volume, but also gets benefit from the waste by being raw material, reduce energy, etc

Further to the study, the sludge from rolling operation, more than 20,000 tons/year may be reverted from discarded waste to valuable material with recyclability of its components. The recycling components, which are fine iron oxide, will be a raw material in blast furnace mill in abroad and contained oil, will be secondary fuel in cement kiln in Thailand. Landfill, a final disposal method, will be give up for this sludge type.

Beside to raw material being, industrial waste reduction is also natural resources conservation as fuel oil and iron mineral as in this project.

While landfill method does not operate, the health and environmental impact caused by the wastes or the by-products will be also completed such as the emission and migration of landfill gases and leachate.

1.4.2 Social

The management issues for landfilled image from public concerns for the environment and traditional image the public has of a landfill site as a dump. The most commonly expressed concerns with landfills are related to odors, hazard to health, property values, noise, birds, visual aspects, dust, etc. so the recycling can be appropriate decision of landfilled avoiding.

1.4.3 Economic

Rolling mill is an industry, which are high competitor especially foreign rolling plants. The significant solution is operation cost reducing to support economic. In term of waste, it is a topic, which should be concentrated to support economic. Oily sludge from wastewater treatment operation in rolling mill is regularly disposed by landfilling which has to pay for disposal including investment cost, operation cost, maintenance cost, transportation cost, maintenance cost, etc.

In term of cost, the oil sludge recycling also can get income to rolling mill from recycled iron oxide and oil value.

1.5 Methodology

The main processes of this laboratory are extraction or oily sludge separation which solid form to liquid (oil) and solid phases and then make it to purifier. The second step is recyclable determination of each phase. The solid phase determines the characteristics of re-melt grade in iron making plant. Another phase, liquid phase, analyze to determine recyclability of secondary fuel and lignite grade for cement kiln of Siam Cement Co., Ltd.

The selected sample preparation method is a modern technique which is famous to extract liquid in solid samples such as soil, sediment, sludge, etc., microwave extraction technique, has a lot of advantages such as less time required, high accuracy result, using for a variety of tasks and cost-saving. [Peter K., Markus L., and Peter K. 2001].