The Dust Fall in the Rice Mill Factory and Community Area

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Abstract—This research was to study the level of dust fall by using Dust Fall Jar method. The samples were collected totally nine spots divided to be the spots inside the rice mill for four spots and in the community area around the rice mill for five spots which the radius was not further than 800 meters. The samples were collected from October 2011 to February 2012. They were collected every 30 day and then they are taken to analyze the concentration of dust fall. It was found that the highest value of dust fall in the rice mill was at the entrance of the rice mill in front of the office, and its level was 961.18 mg/m²/day in October 2011. The lowest value of the dust fall was at the warehouse area in the front of the rice mill and its value was 33.22 mg/m²/day in December 2011. For the level of dust fall at the community area around the rice mill, it was found that the value of dust fall was lower than the residential reference value of 65-130 mg/m²/day. The dust samples were observed using the microscope in the magnification of 100 times. These studies showed that the morphology of the dust were rice husk, soil dust and road dust.

Keywords—Dust Fall, Rice mill, and Phitsanulok Province

I. INTRODUCTION

PHITSANULOK province, Thailand is one of the important economic areas in which there is a rapid growth of industry, transportation, traffic, and construction activities. The expansion causes air pollution problem because the dust quantity increases as the city expansion increases. The dust has an adverse effect to health and visibility. It adsorbs metal, organic substances and inorganic substances on its surface. The adsorbed matters could transform to an acid when combined with water stream in the air, either rain and stream. It can damage buildings, cause troubles and annoyance among people. Hence, this research emphasized on the study of the concentration of dust fall in industry, rice mill factory and study of heavy metal in community area around rice mill factory.

II. RESEARCH METHOD

Studied locations: the total dust fall samples were collected from nine spots in rice mill factory area and the community area of this factory. The rice mill factory located at Thachang tumbom, Phompiram district, Phitsanulok province. The four spots set inside the rice mill and five spots set in the community area around the rice mill factory which the radius was not further than 800 meters. The dust fall sampling was conducted using dust fall jar method. The dust fall sampling equipment was including of the water sampling cylindrical bottle with a diameter of about 13 cm, height 20 cm. The stand of water samples container was used 1.5 m long pipe. The basket for bottle samples was used. The dust fall equipment was shown in Figure 1. The sampling period was 30 day starting from October 2011 to February 2012. One spot gave five dust fall samples. Studies parameters and sample analysis; the concentration of the dust of which dust fall was analyzed by weight measurement or gravimetric method. The samples were analyzed using microscope 100 times of magnification for dust morphology.

Fig. 1 The dust fall sampling equipment

III. RESULTS AND DISCUSSIONS

A. Concentration of dust fall in rice mill area

Dust fall samples were collected 30 days at 4 spot in rice mill area. The first sampling site set at factory entrance, the second spot set at office of the rice mill. The third spot was home of workers, behind the mill. The fourth spot was warehouse located in front of the mill. The concentrations of dust fall inside the rice mill area were a maximum of 961.18 mg/m²/day in October 2011 at factory entrance. The minimum of dust was 33.22 mg/m²/day at warehouse in December 2011. (Figure 2) Because farmers harvested before flood coming and
sold paddy to the mills of 20,000 tons per day in October 2011, the route of trucks passed through the factory entrance made the high level of dust fall. Some of dust samples were exceeding the reference value of the light industry of 100 - 200 mg/m²/day. [1] The data comparing with other research, the occupational exposure to organic dust in rice mill workers were studied levels of microorganisms in 8 rice mills in Songkla province. The research results found of the total microorganisms were 3.1 x 10⁴ cfu/m³. The concentration of total airborne microorganisms not exceeded the Occupational Exposure Limit (OEL) value of 10⁵ cfu/m³. [2]

The samples were analyzed using microscope 100X magnification for dust morphology. Characteristics of dust fall inside the rice mill showed a similar elongated shape of rice husk and dust fall a round or spherical porous solid. The dust fall photos showed in figure 3.

The samples were collected 30 days at 5 spot in community area of rice mill. The first sampling site set at village near Sukhothai – Phitsanulok route main road far from rice mill 800 meters. The second site set at village far from rice mill 400 meters. The third site set at village the opposite of factory far from mill 400 meters. The fourth and fifth sites set at villages far from the mill 50 and 60 meters. The concentrations of dust fall in community around the rice mill area were a maximum of 112.60 mg/m²/day in October 2011 at site 7. The minimum of dust was 13.53 mg/m²/day at site 8 in December 2011. (Figure 4) It was found that the values of dust fall were not exceeding the residential reference value of 65-130 mg/m²/day. [1] This data comparing with the deposition of dust fall in an area and vicinity of Narsuan University, Phitsanulok, northern part of Thailand, were 22.18-100.64 mg/m²/day that was sampling period of July 2010 to December 2010. [3] The dust fall in Phitsanulok city areas, northern part of Thailand, were 3.74-175.64 that sampling period was November 2009 to October 2010. [4]

The samples were analyzed using microscope 100X magnification for dust morphology. Characteristics of dust fall inside the rice mill showed a similar elongated shape of rice husk and soil dust, road dust, shape-edged and density shape. The dust fall photos showed in figure 5

The data comparing with other research, the study of fine particulate matter in Phitsanulok homes, the non-roadside samples were found to be soil dust and construction dust, shape-edged and density shape and contained mostly elements Si (Figure 6). [5]
The data comparing with other research, the effect of sugar cane burning on air quality and cane properties was found sugar cane ashes and contained mostly element Si. [6]

IV. CONCLUSION

It was found that the highest value of dust fall in the rice mill was at the entrance of the rice mill in front of the office, and its level was 961.18 mg/m$^2$/day in October 2011. Because farmers harvested before flood coming and sold paddy to the mills of 20,000 tons per day. The most of dust samples that sampling in October 2011 to December 2011 were exceeding the reference value of the light industry of 100 - 200 mg/m$^2$/day. The level of dust fall at the community area around the rice mill, it was found that the value of dust fall was not exceeding than the residential reference value of 65-130 mg/m$^2$/day. The dust samples were observed using the microscope in the magnification of 100 times. These studies showed that the morphology of the dust was rice husk in the rice mill area but outside of rice mill factory we found the soil dust and road dust.

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